metal

the news digest magazine

Volume XXVII-No. 5 May, 1954

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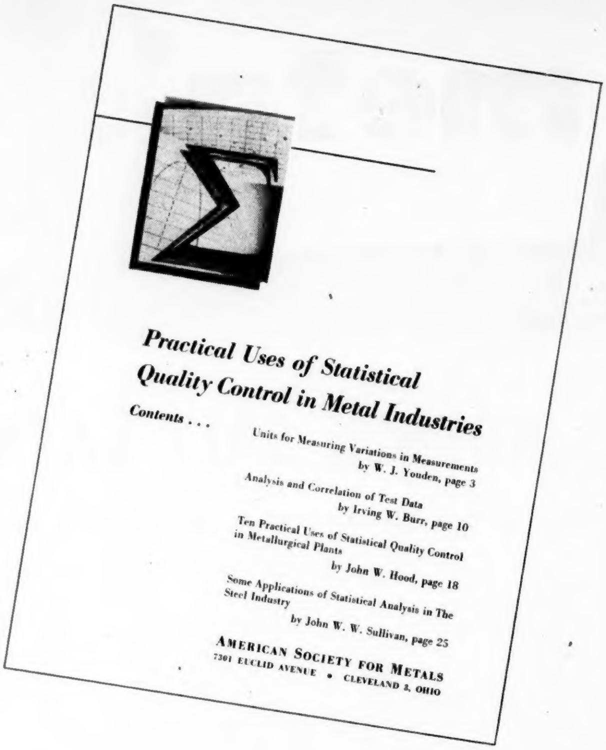

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Metals Review

THE NEWS DIGEST MAGAZINE • **VOLUME XXVIII, No. 5** **May, 1954**

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Hartford Organizes For Education

Secretary William H. Eisenman has received a communication from Wm. Mounce of International Nickel Co., chairman of the Hartford Chapter, outlining the work of the Chapter and its cooperation with the National Science Teachers Association and the Guidance Counselors Association of the State of Connecticut. This report is so interesting and so prolific in portraying the possibilities of chapter work in the educational field that it is printed herewith. The chart (below) shows how the Chapter's educational facilities are distributed.

The Hartford Chapter meeting in March, in cooperation with the University of Connecticut, was an early step in a program that we are developing to carry out the aims of the A.S.M. to promote knowledge and interest in metals technology at the secondary school level. The first discussions that were to result in th's program began two years ago, and the initial contacts with the officers of the two groups were established last year. The March meeting was the first joint activity to include the general membership of the societies concerned. We hope that within the next two years the program wi'l mature to full cooperation between Hartford and New Haven Chapters A.S.M. and the Science Teachers Association and Guidance Counselors Association on a state-wide basis.

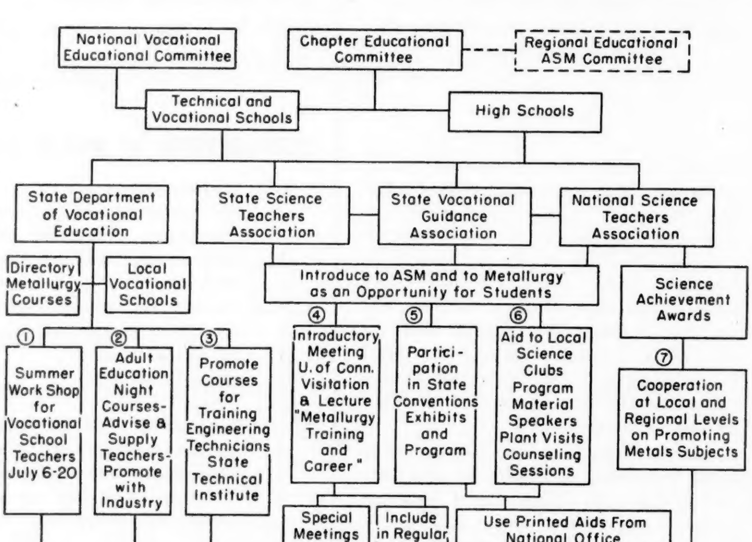
It now appears that several other of our educational activities can be integrated with this plan to provide an even broader plan with a goal of not only increasing the supply of college freshmen interested in metallurgy, but of providing industry with young people who have been trained in metallurgy and have an appreciation of opportunities for a career in metals technology.

After much deliberation and several trials, we have concluded that our educational efforts have been most productive when directed to encouraging trade and academic schools in providing formal courses in metals subjects for both adult and secondary students. Men can be more thoroughly trained by such courses than they can by chapter-operated educational programs, and a reservoir of knowledge and skills can be created from which industry can draw. We hope to increase the number and broaden the scope of courses in metals technology by outlining the need, advising as to course content and equipment, providing teachers and stimulating industry to the opportunity to have their men trained. The program of the A.S.M. National Vocational Educational Committee under Chairman Bill Collins has very recently become part of this effort.

Perhaps the attached diagram will best illustrate our over-all plans. The status of the various end points can be discused in more detail as follows:

1. Summer workshop for vocational school teachers, initiated by Bill Collins' Vocational Educational Committee. At a recent meeting with the Connecticut State Vocational Education Department it was established that a two-week workshop course will be given starting July 6. A group of 20 to 25 teachers from all over the state will be carefully selected by the educational department to receive 30 hr. of lectures and 30 hr. of laboratory instruction. The teachers will spend the balance of the month preparing manuals for their own use in applying the information to their own courses. Teachers from the following courses will be included: Machine tool practice; tool and die making; science; mechanical drafting; apprentice guidance. The state education department will give participating teachers professional credit for this course. It will be given at the Regional Technical School in Hartford, using the laboratory originally organized and equipped under the instigation of the Hartford Chapter. The course will be taught by E. L. Bartholomew of the University of Connecticut, our educational chairman, and the Chapter will be responsible for organizing the course. The state education department will integrate the material from this course into existing trade school courses, and shares our hope that the eventual result will be fully developed courses in metals technology, and the establishment of suitably equipped teaching facilities in other trade schools in the state.

2. Increase the adult courses in metals subjects, vocational and academic. Early in World War II the Hartford Chapter worked with the Hartford Regional Technical School to equip a laboratory and establish night courses in metallurgy and heat treatment that would be available to adults already working in industry. These courses have continued uninterrupted each semester to the present. They have been taught by A.S.M. members, and a growing number of men now holding responsible positions in local industry have received their training in these courses. A night course for which college credits are given was also established at Hillyer Junior College



in Hartford, and taught continuously by A.S.M. members. We are now in the process of advising Hillyer on laboratory equipment and course content for a broader program. The directory of metallurgical courses published last fall by the Hartford Chapter has been widely circulated in local plants and created additional interest and registration in the courses.

3. Promotion and training of engineering technicians by State Technical Institute. In an attempt to alleviate the shortage of professionally trained engineers, the Hartford Chapter last fall proposed to the Hartford vocational school system a plan to train students in the basic science laboratory techniques. These graduates would enter industry seeking employment in laboratories and engineering departments and would be equipped with enough knowledge to suit them for further training as engineering technicians by the companies. As a result of this proposal we have been invited by the State Technical Institute to form an advisory committee to establish the proper courses. The Connecticut State Technical Institute offers two-year courses in mechanical, electrical and tool technology to high-school and trade-school graduates. The caliber is equivalent to grades 13 and 14 (years 1 and 2 of college). Coupled with the eventual results of the summer workshop for vocational school teachers and the adult education programs, an increasing source of technically proficient talent should be available to industry.

4. Cooperative program with State Science Teachers Association, State Vocational Guidance Association and National Science Teachers Association. This over-all program is aimed at providing the colleges with incoming students aware of the opportunities in metallurgy as a career. It will also supplement the vocational school program for students not going on to college. The first step was the meeting at the University of Connecticut with the science teachers and guidance counselors to serve to introduce A.S.M. and metallurgy to the general membership of the two groups. The meeting was a promising beginning. Aside from our own members, 22 science teachers, 5 guidance counselors and 20 New Haven A.S.M. members attended, as well as many of the students and staff of the mechanical engineering department of the University of Connecticut. A really gratifying amount of interest was shown by those attending and we are sure that a reputation has been established that will improve our effectiveness in future plans. Our ultimate hope is to build up the interest of these groups so that their members will attend our regular chapter meetings of interest to them. We also plan special meetings aimed specifically at these groups, such as panel discussions by A.S.M. members of training and opportunities in industry.

5. To participate in state association conventions. Last year our educational chairman was present at the state convention of science teachers with a limited exhibit of A.S.M. literature available. We hope to follow this up with a formal exhibit at future conventions and, perhaps, actual participation in the programs of both groups as our cooperation matures.

6. We have offered to cooperate in local high-school science programs or guidance sessions, working through the state groups. We will offer A.S.M. literature, A.S.M. and industry movies for program material, speakers, and will arrange plant visitations. These will be direct contacts with students, but we feel that arrangements are best made by working through the state associations down to the individual teachers rather than by direct contact with local schools.

7. We would like to suggest a much broader participation by local chapters in the science fairs conducted by the National Science Teachers Association. We feel that much more interest could be stimulated in metallurgical subjects if local members worked with their local schools, with the regional awards now provided by A.S.M. as the goal. The assistance of the National Office through its association with the N.S.T.A. to bring about more cooperation at the local level would be very helpful.

I hope this discussion has not been too voluminous but we are enthusiastic about the way a number of independent activities of the Chapter are slowly developing into an over-all pattern that some day should be of real benefit to the metal working industry.

Hartford at University of Connecticut

Science Teachers on a Busman's Holiday Visited the University of Connecticut With Members of the Hartford Chapter. Shown during one of the tours are, from left: H. E. Norris, Loomis School, vice-president of C.S.T.A.; Nickerson Rogers, Loomis School; Elizabeth Quinn, Saxe Junior High School, president of C.S.T.A.; William Mounce, chairman of the Hartford Chapter A.S.M.; and E. L. Bartholomew, Jr., A.S.M., professor of mechanical engineering at University of Connecticut and technical chairman of the meeting

Speaker: W. A. Backofen

Massachusetts Institute of Technology

"Metallurgy and Education" was the theme of the Hartford Chapter's visit to the University of Connecticut. Other groups attending the program included members of the New Haven Chapter A.S.M., the Connecticut Science Teachers Association and the Connecticut Personnel and Guidance Association.

The afternoon program consisted of guided tours of the school of engineering and the chemistry and physics laboratories.

The speaker at the evening program, W. A. Backofen, assistant professor of metallurgy, Massachusetts Institute of Technology, in a talk on "Training the Metallurgist", pointed out the necessity for presenting a more broadened field of knowledge to the students in secondary schools to meet the specialized demands of modern industry.

Dr. Backofen, a member of the M.I.T. admissions committee, has visited many New England secondary schools giving counsel to students and making known the need for careers in metallurgy.—**Reported by E. G. Malmstrom for Hartford.**

Metal Casting Topic of Grossmann Lecture

A Guest of the Mahoning Valley Chapter During Their Annual Marcus A. Grossmann Memorial Lecture Night, Mrs. Grossmann, Is Shown With Harold H. Johnson, Chief Metallurgist at National Malleable and Steel Castings Co., Sharon Works, Who Spoke on "The Casting of Metals"; E. J. P. Fisher, Chapter Chairman; R. D. Everett, Technical Chairman; and K. L. Fetters, Assistant to the Vice-President, Youngstown Sheet and Tube Co.

Speaker: Harold H. Johnson

National Malleable & Steel Castings Co.

Harold H. Johnson, chief metallurgist for the Sharon Works, National Malleable and Steel Castings Co., presented the annual Marcus A. Grossmann Lecture to the Mahoning Valley Chapter. He spoke on the "Casting of Metals".

Marcus Grossmann, who at the time of his death in 1952 was adviser, research planning, U. S. Steel Corp., and a nationally known metallurgist, was born and raised in the Mahoning Valley area. Each year an outstanding local man is honored by being chosen to deliver the main address. This meeting, as well as the Memorial Lecture last year, was attended by Dr. Grossmann's widow.

Mr. Johnson pointed out that the melting and refining of steel has received considerable attention in the past and will be the subject of a great deal of study in the future. However, the other side of the picture, the manufacture of molds into which the steel is poured, has received somewhat less attention. The speaker stated that there are more variables to control in the making of a mold into which steel can properly solidify than there are in the solidification of the steel itself. He described some of these variables and their comparisons to steel ingot solidification.

The main considerations upon which metal solidification rests are the volume changes of the metal during cooling from the molten state to room temperature, and the principles of heat transfer as applied to the cooling mold.

The first factor is very important in the proper feeding and proper tolerances in mold design. Therefore, shrinkage properties of the metal to be cast must be known. Liquid and solidification shrinkage are provided for by supplying risers. When using risers the factors to be considered are: Riser must stay liquid longer than the casting; it must be fed into the spot that solidifies last; it must contain sufficient metal to feed the casting during complete solidification; and the number and shape of the risers must be controlled.

When considering heat transfer, the size, shape and composition of the mold are important factors. Heat transfer is more rapid on locations of largest surface area to volume ratios. Sharp corners are to be avoided in casting design as shrinkage pockets are likely to be encountered which would be conducive to stresses and subsequent failure in service. This problem is of a somewhat minor nature in steel ingot castings as the molds are of simple and fairly constant design.

Mr. Johnson mentioned a problem encountered recently in the manufacture of castings. Many times in making sand mold castings the product is either longer or shorter than would be expected. It was found that the pH value (acidity-alkalinity) of the sand might influence the ramming of the mold and, in turn, the final size of the casting produced.

A movie, "Shell Molding", was shown through the courtesy of the Monsanto Chemical Co. as being representative of recent developments in foundry techniques.

The speaker emphasized the fact that the manufacture of castings is being changed from an art to a science.—**Reported by John D. Anderson, Jr., for Mahoning Valley.**

Outlines Industrial Progress in Canada

Speaker: Frank Forward

University of British Columbia

At a meeting of the British Columbia Chapter, Frank Forward, University of Birtish Columbia, presented a talk on his recent "Research Developments and Travels". Prof. Forward brought Chapter members up-to-date on the history of their Chapter, which he had helped to form in 1941.

Twenty-five years ago, Prof. Forward stated, Canada did very little with its natural resources, but this is no longer so. Top economists state that only six countries in the world have abundant supplies of coal, iron ore and sulphur. Any country with these basic raw materials must inevitably become one of the world's leading nations. Canada has these materials plus many others. Universities and industries are training men across Canada, along with skilled immigrants from the United States, but more particularly at the present from Britain and Europe, to fill the gap of the many positions which are now becoming available.

Prof. Forward described developments in such fields as nonferrous manganese magnetic alloys, new methods of precipitation of metals and the possibilities of titanium.

The film "Prelude to Kitimat", presented through the courtesy of the Aluminum Co. of Canada, was shown. Robert Muir of the company's public relations department acted as commentator. The film illustrates the tremendous task undertaken and brought to practical completion by the Aluminum Co. of Canada in British Columbia.—**Reported by R. H. Fenton for British Columbia.**

Points Up Progress In Aluminum Production

Speaker: John R. Willard

Aluminum Co. of America

The Savannah River Chapter heard John R. Willard, manager of the sales engineering and development division for the Aluminum Co. of America, speak on "What's New in Aluminum" at a recent meeting.

Mr. Willard pointed out how both commercial and industrial uses have increased aluminum production from 1,800,000 lb. in 1944 to an anticipated 3 billion lb. during 1954. This production rise can be attributed to the many new phases of alloy development, one of which is APMP (aluminum powder metal products). Another influencing factor on production has been the recent construction of larger extrusion and forging presses.

A breakdown of the potential aluminum markets indicates that the most promising field is architecture, with transportation a close second. One excellent example for displaying the structural value of aluminum is the 30-story Alcoa building in Pittsburgh, which has recently been completed. Other new applications for aluminum products which Mr. Willard mentioned were building sheathing, electrical products, tank cars and irrigation piping.—**Reported by Morton S. Cecil for Savannah River.**

Boston Honors Officers Past and Present

Attending Boston's Annual Officers Night Were: (Left) From Left: Chairman S. H. Baylor, National President J. B. Austin and National Secretary Eisenman. Below: (Top): John Chipman, E. L. Bartholomew, Mr. Dodds, W. J. Squire and J. B. Austin Were Presented 25-Year Membership Certificates. (Center): Past National Presidents John Chipman, R. L. Wilson, Bradley Stoughton, W. Jominy and A. E. Focke. (Bottom): National Trustees A. O. Schaefer, G. M. Young, W. A. Pennington, Treasurer, President Austin, R. Raudebaugh, R. L. Wilson, Past President, and W. H. Eisenman

Speaker: James B. Austin
U. S. Steel Corp.

The Boston Chapter was host to five past national presidents, seven national trustees, twenty past chapter chairmen and five recipients of 25-year membership certificates at its March meeting in observance of National Officers' and Past Chairmen's Night.

This meeting was contiguous with the National American Society for Metals Midwinter Meeting held in Boston on March 4 and 5, and proved to be one of the outstanding meetings of the year.

Dr. James B. Austin, national president, presented his illustrated talk on "Magnification in Time in Metallurgical Operations". Since Dr. Austin has made this speech before many of the A.S.M. chapters it will not be repeated here.

Past chairmen who were present included: E. L. Bartholomew, R. S. Williams, H. H. Lester, H. B. Parker, H. E. Handy, A. D. Bach, Peter Kosting, H. N. Downing, A. J. McDuff, D. M. Robinson, A. L. Knight, F. P. Flagg, Paul Ffield, Louis Geerts, R. G. Sault, J. V. Baxter, J. T. Norton, C. G. Lutts, W. P. Knecht and Horace Ross.—**Reported by R. A. Pomfret for Boston.**

Frary Presents Jeffries Night Lecture

Francis C. Frary, Technical Advisor of the Aluminum Co. of America's Research Laboratories, Presented the Annual Zay Jeffries Night Lecture on "Aluminum Research in Cleveland" Before the Cleveland Chapter. He is shown (left) receiving a commemorative plaque from Taylor Lyman, editor, Metals Handbook, and Publisher of Metal Progress at A.S.M. headquarters

Speaker: Francis C. Frary
Aluminum Co. of America

Francis C. Frary, for 33 years director, and at present technical advisor, of the Research Laboratories of the Aluminum Co. of America, delivered the fourth annual Zay Jeffries' Night Lecture before the Cleveland Chapter. This lecture was established to honor Zay Jeffries, world-famous metallurgist and a founder member of the Cleveland Chapter. Dr. Frary, who worked with Dr. Jeffries, a consulting metallurgical engineer for Alcoa from 1920 to 1936, described the "Progress of Aluminum Research in Cleveland From World War I to the Present". Much of this progress began with work done by Dr. Jeffries and his co-worker Robert Archer.

Jeffries' and Archer's collaboration began with problems associated with the casting of the cylinder block of the Liberty engine. Cast aluminum alloys did not respond to thermal treatment in the same manner described by Wilm for wrought duralumin. Jeffries and Archer reasoned that the coarser structure typical of castings should respond if the solution heat treatment time was extended. Experimental evidence confirmed this reasoning and the heat treatment of certain cast alloys was thus established. Specifically, the commercial, heat treatable aluminum-copper alloy 195 was able to be developed.

In 1921, Jeffries and Archer, in an attempt to improve the forgeability of duralumin, reduced the magnesium content and developed alloy 25S, used in World War II for hundreds of thousands of aircraft propellers. The Cleveland scientists found that artificial aging at elevated temperatures improved the tensile properties of solution heat treated and quenched 25S, thus originating this type of heat treatment. Alloy 51S was next developed with its excellent forgeability. In 1931, improvements in equipment and techniques made the forging of duralumin feasible and the artificially aged duralumin-type alloy 14S came into common use. During World War II the higher strength aluminum-magnesium-zinc alloys 75S and 76S were developed and the techniques for forging them were born in Cleveland.

During this period, American foundry practice expanded, using primarily the aluminum-copper alloys, while European foundries were working generally with aluminum-silicon alloys. In time, the outstanding casting characteristics of the aluminum-silicon alloys and particularly the sodium-modified alloys were recognized in this country. Jeffries and Archer found that a 5% silicon alloy possessed good properties without the necessity for modification. In 1925 the addition of magnesium to the silicon alloys was found to make them amenable to heat treatment and led to the development of the presently widely used alloys 355 and 356.

The ever-burgeoning automotive industry has frequently made demands on the aluminum industry and one demand was for the development of a casting alloy with low thermal expansion characteristics suitable for cast pistons. Alloy 132 and its present counterparts, D132 and the wrought alloy 32S, were Cleveland developments to meet this demand.

In 1928, Dr. Jeffries adapted the then new medical X-ray techniques to the light alloy foundry industry in order to reveal internal discontinuities in castings. It was in this field that Kent R. Van Horn, the present director of research for Alcoa, became world-renowned. The application of radiographic procedures has expanded to such an extent that 28 industrial X-ray units are in use by Alcoa in the U. S.

The aluminum-tin alloys were investigated in the Alcoa Laboratories at Cleveland with the result that alloy 750 was developed in 1940 specifically for bearing applications. At present, automotive, aircraft, diesel engine and rolling mill bearings are being fabricated from this and allied alloys.

One of the most recent developments of the Cleveland Research Laboratories has been concerned with the techniques of permeable plaster as a molding material for castings. This medium enables the duplication of accurate dimensions, smooth finish and complicated forms, and nicely complements the older sand and permanent mold casting processes.

Twenty-five year membership certificates have been awarded to Cleveland members, George Jenkins and Jacob Kroecker.—**Reported by A. M. Montgomery for Cleveland.**

St. Louis Completes Course on Inspection

The St. Louis Chapter has just completed one of its most successful educational courses to date. The series consisted of five lectures on the "Inspection of Metals". H. B. Pulsifer's book of the same title was used to supplement material presented in the lectures. The speakers and their topics were:

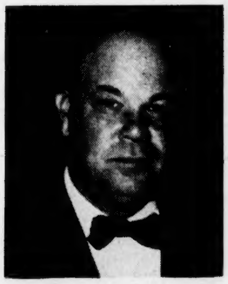
Chemical Tests, by C. D. Trowbridge, St. Louis Testing Laboratories; Mechanical Tests, by R. N. McGee, Jones & Laughlin Steel Corp.; Visual Tests, by John Patton, General Steel Castings; Microscopic Tests, by Karl Kaveler, United States Defense Corp.; and Specifications and Review, by B. J. Esarey and B. J. Sexauer, National Bearing Division of American Brake Shoe Co.

A total of 212 were enrolled in the course. The average attendance was 150, and certificates of 100% attendance were given to 113 persons. A total of 50 organizations was represented by those enrolled in the course.—**Reported by Herbert A. Ball for St. Louis.**

Meet Your Chapter Chairman

Neal Russell

H. D. Beeson



J. D. Duncan

NEW YORK

NEAL M. RUSSELL, sales representative for Vanadium-Alloys Steel Co., was born in Washington, Pa. He attended Washington elementary and high schools, Geneva College and Carnegie Institute of Technology. He participated in both football and track at school.

Neal's first job was as a laboratory assistant in the chemical and metallurgical laboratory of a U. S. Steel Corp. subsidiary. Later jobs included work as foreman of a sheet normalizing furnace, metallurgist at the bureau of standards of a chain store, and metallurgist for a U. S. Navy Torpedo Station.

Neal and his wife have a daughter, 14, and a son 8 years old. He is a member of the American Society of Tool Engineers and Rotary and Kiwanis Clubs, and has served on the program, educational and yearbook committees of the New York Chapter A.S.M. His hobbies are pipe organ music and records, and he is an adult advisor of a church young people's group.

KANSAS CITY

H. D. BEESON, sales engineering department, Aluminum Co. of America, is a native of Winston-Salem, N. C. He received a B.S. degree in 1942 from Georgia Institute of Technology, where he was a football and basketball manager. His first job was in production work in the aluminum smelting plant at Alcoa's plant in Tennessee.

Mr. Beeson is married and has two children. He is a member of the Kansas City Engineers Club, and has served on the membership, entertainment and program committees of the Kansas City Chapter A.S.M. His spare time hobby is golf.

BRITISH COLUMBIA

A. D. HARDING, district manager for Atlas Steels Ltd., was born in Kingston, Ont. He graduated from college with a B.Sc. degree in mining and metallurgy, and started as a mining engineer on development work on mining steel for Atlas Steel Ltd. after completing college.

Mr. Harding enlisted in the R.C.A.F. in 1940 and was transferred to an army status as major later, working as a civilian for the British and Canadian governments. He is married and has two children, 12 and 17 years of age, and is a member of Kiwanis Club. He was on the executive committee of the British Columbia Chapter for four years. He played rugby while in college.

GOLDEN GATE

ROBERT B. FREEMAN was born in Riverside, Calif., and attended public and high schools in Pasadena. He received a Ph. D. degree in mechanical engineering from California Institute of Technology in 1936. His first position was assistant metallurgist at the Torrance plant of the Columbia Steel Co., and he advanced to various positions up to chief metallurgical engineer of Columbia Geneva Steel Corp. in 1950, after which he was appointed project engineer to rehabilitate the Columbia Steel Defense Plant Corp. foundry, Pittsburg, Calif. After completing that assignment he was appointed assistant to the general superintendent of the Pittsburg plant, the position which he now holds.

Mr. Freeman, his wife and two children live in Walnut Creek, Calif. He is active in the Rotary Club and is a member of many technical organizations, including A.I.S.I., A.I.M.E., A.S.T.M., Associated Iron and Steel Engineers and the British Institute of Metals. He was a member of the executive committee of the Golden Gate Chapter for two years, and has served on A.S.T.M. Committee-A-1.

His hobbies are golf and his home work shops where he turns out many useful and interesting objects for his home.

INDIANAPOLIS

J. D. DUNCAN was born in Somerville, Mass., attended grade school in Somerville, and junior and senior high school in New Castle, Ind. He holds an A.B. degree from Hanover College. During college he won four letters in football, and served as assistant coach and line coach during his senior year. His first job out of school was as a heat treat furnace operator for the Link-Belt Co., Dodge Plant, and he has served as assistant foreman, heat treat department. He is now department head of heat treating at the Ewart Plant of the Link-Belt Co.

Mr. Duncan is married, no children. He is a member of Phi Delta Theta Fraternity, Evergreen Masonic Lodge, Scottish Rite, Murat Shrine, Board of Deacons and the First Presbyterian Church in Indianapolis. He is a Sunday golfer and a Cub Scout executive.

HARTFORD

WILLIAM MOUNCE, International Nickel Co., was born in Woodstock, Vt., and attended Tufts College and Massachusetts Institute of Technology. His first job was as a metallurgist with the Hamilton Standard Division of United Aircraft Corp. He is presently a member of the Northeast Technical Section, Development and Research Division, International Nickel.

Bill is married and has one boy. He likes to ski and is interested in color photography. During the World Metallurgical Congress he served as a representative.

PURDUE

THOMAS J. HUGHEL, assistant professor of metallurgical engineering at Purdue University, was born in Anderson, Ind. He received his B.S. degree in metallurgical engineering from Purdue in 1942 and his Ph.D. degree from Purdue in 1951.

T. J. Hughel

He served as an ensign in the U. S. Naval Reserves, and subsequently as teaching assistant and instructor in metallurgy at the University. Tom is married and has one son, 9 years old. He is a member of A.I.M.E., Sigma Xi, Sigma Gamma Epsilon, Phi Lambda Upsilon and the American Society for Engineering Education. He has served on the executive and program committees for his A.S.M. chapter and on the national committee on vocational education.

His hobbies are photography and record collecting.

Gives Hints on Buying Toolsteels at Chicago

H. E. Replogle, Universal-Cyclops Steel Corp., Presented an Interesting Discussion on "How To Buy Toolsteel" at the Annual Toolsteel Night Meeting of the Chicago Chapter. Shown, from left, are: Otto Zmeskal, chairman; D. R. Edgerton, Lindberg Steel Treating Co.; Mr. Replogle; Bill Long, Universal-Cyclops Steel Corp.; and J. A. Kubik, chapter vice-chairman

Speaker: H. E. Replogle
Universal-Cyclops Steel Corp.

Chicago Chapter members heard H. E. Replogle, Universal-Cyclops Steel Corp., give a talk on the "Problems Involved in Buying Toolsteels". Mr. Replogle introduced a technique which should be highly recommended to other A.S.M. lecturers. Near the beginning of his talk he handed out mimeographed copies of a complete and well-organized outline of his subject. Then, as he pointed out, he "started at the beginning and finished at the end", following the outline closely and interspersing pertinent remarks ad lib. Listeners were thus able to get considerably more from the lecture on the spot, and were able to take home with them a summary of the important aspects of toolsteel characteristics.

Mr. Replogle defined toolsteels, categorizing them into several clear-cut classifications. Under each classification he discussed the types, analyses, heat treatments, properties, applications and costs. He emphasized several important points involved in the buyer's proper choice of toolsteels. Among these was the advice that neither the cheapest nor the most expensive steel was necessarily the correct one for a given job, but rather the steel which would give the best and longest service per dollar of cost.—**Reported by Paul Gordon for Chicago.**

St. Louis Holds Panel On Materials Problems

A panel discussion on "Materials Problems" was held by the St. Louis Chapter recently. The classification of questions was divided into magnesium, aluminum, steel, toolsteel and copper-base alloys, and the following speakers made up the panel:

G. Ansel, technical director, Madison Div., Dow Chemical Co.

Frank Delaplane, manager of the Extrusion Div., Cupples Products Co.

D. S. Eppelsheimer, professor of metallurgical engineering, Missouri School of Mines and Metallurgy.

C. Don McLain, chief technical advisor, Metals Div., Olin Industries.

R. F. Spillett, metallurgical engineer, Crucible Steel Co.

Included in the announcement mailing for this meeting were self-addressed post cards soliciting questions for discussion. In asking for questions emphasis was placed on the shop problem type. As each subject which had been presented was discussed, additional questions from the floor were encouraged.

The Chapter was host to 29 students from the Missouri School of Mines and Metallurgy.—**Reported by Frank Delaplane for St. Louis.**

Describes Fatigue Testing Machine at Notre Dame

Speaker: Arthur F. Underwood
General Motors Corp.

The Notre Dame Chapter heard Arthur F. Underwood give a talk on "Practical Fatigue Testing" at a recent meeting. Mr. Underwood is head, mechanical development department, Research Laboratories Division, General Motors Corp.

Mr. Underwood stated when he was first employed by G. M., the testing of metals consisted of hardness, tensile, impact and other methods. It was soon found that this type testing was not giving needed engineering data, and a piece of equipment that would handle full-scale laboratory and production piece parts was developed. This machine was hydraulically actuated and gave push, pull and twisting motion to the part being tested.

As a result of their testing with this equipment, G.M. found that usually only a slight change in design was necessary to make a faulty piece entirely satisfactory.

Mr. Underwood showed slides to illustrate his talk and closed with a lively question and answer period.—**Reported by R. C. Pocock for the Notre Dame Chapter.**

Philadelphia Juniors Visit Midvale Co.'s Plant

Pictured Above Are Most of the 86 Persons Visiting the Midvale Co. During a Recent Meeting of the Junior Section of the Philadelphia Chapter. The plant tour included visits to the openhearth, the electric melting department, the machine shop and the press forgings department. (Reported by F. J. Klein)

Notes Effects of Microstructure

Speaker: Ford E. Dreves
Wyckoff Steel Co.

"The Effects of Cold Drawing, Microstructure and Thermal Treatments on the Machinability and Mechanical Properties of Carbon and Alloy Steel" were discussed by Ford E. Dreves, metallurgical engineer, Wyckoff Steel Co., in Hartford.

Mr. Dreves gave a brief description of the cold finishing operations—cold drawing, straightening, turning, centerless grinding and polishing, and presented detailed information on the effects of microstructure, cold drawing and thermal treatments on the machinability and mechanical properties of steels.

He pointed out that with normal drafts there is no observable distortion of the structure at the surface on low carbon steels when examined under the microscope. The hardness induced by cold drawing penetrates to the center of the bar.

Using B1112 and C1020 steels as examples for the effect of cold drawing on mechanical properties, the increase in yield and tensile strength was noted on slides that were shown.

Ferrite, inclusions and iron carbide are the major characteristics of microstructure that effect machinability. Cold drawing reduces the ductility of ferrite, giving a smoother chip and better surface finish. Some types of inclusions cause excessive tool wear. Manganese sulphide inclusions have a lubricating effect and prevent a built-up edge on the tools. The globular shape of manganese sulphide inclusions showed better machinability results than the thin stringy type.

The shape and distribution of iron carbide have a marked effect on surface finish, tool life and production. When the quantity of pearlite exceeds that of free ferrite the abrasive action of the carbides becomes more evident.

As an example that hardness is not necessarily a criterion of machining quality, 8640 and 4140 steels annealed and cold drawn with the same hardness show better machinability results on bars with the lamellar pearlite anneal than those with the spheroidize anneal. In the higher carbon alloy grades of steel the spheroidize annealed structure is generally preferable for best machinability.

Stress relieving after cold drawing is done for various reasons. The purpose may be to improve ferrite ductility, restore elastic properties reduced in cold drawing or to prevent distortion resulting from unbalanced stresses when cold drawn bars are machined.—**Reported by E. G. Malmstrom for Hartford.**

Atomic Energy Talk at Milwaukee

From Left: Alfred Amorosi, Argonne National Laboratories, Who Spoke on "Industrial Applications of Atomic Energy" at a Meeting in Milwaukee, Is Shown With Robert G. Matters, Allis Chalmers Manufacturing Co., Technical Chairman, and W. D. Trueblood, Leeds & Northrup, Vice-Chairman

Speaker: Alfred Amorosi
Argonne National Laboratories

"Industrial Application of Atomic Energy" was the title of the talk presented at a meeting of the Milwaukee Chapter by Alfred Amorosi, associate director, Reactor Division, Argonne National Laboratories.

Mr. Amorosi presented a colored film "A Is for Atom" which portrayed the basic ideas of atomic energy in an understandable manner. He then discussed the application of reactors to central power station use, broadly covering the aspects of necessity, feasibility and economics, comparing atomic energy reactors now in operation with present-day coal-operated power plants. He stressed the part the metallurgist plays in the development of materials suitable to make this new source of energy a reality in the not-too-distant future.—**Reported by E. H. Schmidt for Milwaukee Chapter.**

Explains Metal Flow in Deep Drawing of Aluminum

Speaker: John W. Lengbridge
Aluminum Goods Ltd.

John W. Lengbridge, project engineer, Aluminium Goods Ltd., spoke on "Metal Flow in Deep Drawing Operations in Aluminum" at a meeting of the Ottawa Valley Chapter. To illustrate his talk, Mr. Lengbridge displayed blanks, partly finished products and finished products of aluminum.

Mr. Lengbridge developed his subject from the point of metal flow from one geometry to another, without change in metal thickness or area. The necessary volume in the form of an inexpensive and readily obtainable geometry, such as sheet, is changed into the same volume of finished product by a drawing operation, the wall thickness and area remaining approximately constant. The speaker illustrated the fact that the metal must be adequately supported at all times to achieve this result without wrinkling or tearing (exceeding the ultimate tensile strength) of the metal. A discussion of die design, blank holding pressure and the number of necessary drawing operations for a finished product of several geometries showed that for the same percentage of cold working, the finished product may consist of one draw for a product of one geometry, and several for a product of a different geometry.

Consistent and homogeneous qualities of the subject metal are obviously important. The speaker emphasized this point to his audience and showed them one example of a blank which had directional properties of flow.—**Reported by S. A. Agnew for Ottawa Valley.**

Purdue Offers Course in Statistical Quality Control

An advanced course in "Quality Control by Statistical Methods" will be given at Purdue University from June 14 through June 22, 1954. A new and simplified approach to the subject will be used and practical applications of the methods are to be stressed in lectures, demonstrations and laboratories. Instructors are men with wide experience in teaching short courses and part-time courses in quality control to industrial men.

For more detailed information write: Quality Control Short Course, Comptrollers Office, Conferences, Purdue University, Lafayette, Ind.

Triple Talks Featured at Hartford

Shown at a Recent Meeting Held in Hartford Are, From Left: W. Mounce, Chairman; Professors Mott and Clark, Stevens Institute of Technology; F. Montie, President of the Hartford Chapter of the Society of Carbide Engineers; W. Wight, Technical Chairman, Hartford Chapter A. S. M; and G. J. Comstock, Stevens Institute of Technology, Technical Speaker

Speaker: G. J. Comstock
Stevens Institute of Technology

A joint meeting of the American Society for Metals and the Society of Carbide Engineers, Hartford Chapters, featured talks by Gregory J. Comstock, professor of powder metallurgy, and two of his colleagues from Stevens Institute of Technology, Dr. Clark and Mr. Mott.

Prof. Comstock gave a brief history of "Powder Metallurgy", the oldest form of metallurgy in existence, and presented a new development in that field, a process called "hot coining".

All S.A.E. steels, high-speed steels and stainless steels can be secured in the powder form. In this process the powders are cold formed, heated and forged or hot coined to the desired part which will have the same strength as the steels now used for these parts.

Dr. Clark's talk dealt with "High-Temperature Alloys". She discussed high-temperature problems and the improved physical qualities resulting from the hot coining method.

Mr. Mott presented the "Problems of Introducing Porous Metals in the High-Temperature Field Into the Air-Craft Industry". In discussing the applications of porous metals, he gave the glass industry as one of the examples where the application had helped to solve difficulties.—**Reported by E. G. Malmstrom for the Hartford Chapter.**

Peoria Hears Talk on Field Failures and How To Eliminate Them

Speaker: J. D. Graham
International Harvester Co.

Field failures are surface failures in the greatest percentage of cases, according to J. D. Graham, works metallurgist, International Harvester Co., who spoke before the Peoria Chapter on "Field Failures".

Metallurgy is well on the way to becoming a science rather than an art. Until fairly recently the metallurgist did not know why certain phenomena were encountered during heat treatment or why certain steps were taken to promote or inhibit these phenomena according to the desired finished product. Among these phenomena has been the emphasis placed on high core strength. According to Mr. Graham, this is not as important as having a sound surface, the point at which failure is usually initiated and then propagated through the supposedly tougher core. The problem for metallurgists and designers is to make the surface in such a way as to make initiation of failure unlikely.

The effects of stress raisers were brought out by the speaker. Abrupt changes in section as well as microscopic faults can promote failure due to increased stress concentration at points of such discontinuity.

Fatigue failure is the biggest problem in field failures. The metallurgist or designer can design for static loads or those that are relatively so. Stress raisers do not create the problem under such loads as under applications of repeated loading where flexing aggravates the effect of unknown weaknesses present at the surface. This process of failing under a repeated load which is well below the theoretical strength of the material makes determination of the endurance limit mandatory when designing for repeated loading. The possibility of an unsound surface leads to the use of excessive safety factors which can be eliminated by knowing why and how.

Another major factor in field failures is residual stress. This is brought about by self-upsetting upon heat treatment. Residual stress can be either harmful or beneficial as the case may be. Gears case hardened with the tooth-root line in compressive stress may exceed the actual strength of the material due to the fact that the residual stress must be nullified before the applied stress is active. This may not be true if case hardening is too deep or hardened contour irregular. The presence of tensile stresses in this case or at the surface of parts will have a distinctly adverse effect on theoretical strength.

Mr. Graham called attention to the effect of grinding burns on surface continuity and discussed the use of Tarasov's reagent as an etch to reveal them.—**Reported by W. O. Kaarlela for Peoria.**

Union Carbide Scholarships

New allocations of Union Carbide Scholarships to become effective in the fall of 1954 will bring the number of scholarships presently allocated to a total of 308 of a proposed goal of 400 scholarships.

Ten more educational institutions have been added to the program bringing the total now participating to 34 liberal arts colleges and technical institutions.

The scholarships cover the complete cost of tuition and required fees for a full four-year academic course. In addition, each scholarship carries an annual grant-in-aid of $600 for the college during the life of the scholarship.

The purpose of the Union Carbide Scholarship program is to assist deserving students who are interested in business careers, and to give limited financial aid to a cross section of colleges and technical institutes of traditionally high standing.

Speakers Available

The Consolidated Vacuum Corp. has advised National Headquarters that there are several qualified persons within their organization who are available for talks on recent advances in high-vacuum metallurgy. Chapter program chairmen who are interested in contacting them, please write directly to: Russell Ehle, Technical Writer, Consolidated Vacuum Corp., Rochester 3, N. Y.

New Orleans Receives Chapter Charter

Shown Receiving the Chapter Charter From James B. Austin, A.S.M. National President, Is R. B. Boswell, Chairman of the New Orleans Chapter. In a short talk following the presentation, Mr. Boswell informed members that he was turning over the Chapter's charter and gavel to Perry Jones of Rheem Manufacturing Co., inasmuch as he was being transferred to the Central Engineering Division of Chrysler Corp., Detroit. Since Dr. Austin's talk "Metals of Tomorrow" has been given before several of the chapters, it will not be repeated. (Reported by Frank Ransom for the New Orleans Chapter)

Canton-Massillon Hears Talk on Vacuum Metals

Speaker: James H. Moore
Vacuum Metals Corp.

James H. Moore, general manager of Vacuum Metals Corp., gave a talk on "Vacuum Metals" at a recent meeting of the Canton-Massillon Chapter.

Mr. Moore presented the history of vacuum-melting equipment, covering the early German work and the work done by the National Research Corp., of which his company is a subsidiary, since 1946. He went into the details of reactions and problems involved in melting metals under high vacuum of one to ten microns. Vacuum melting is capable of producing very high purity metals by removing gases, the source of a large percentage of nonmetallic inclusions, and by the vaporization of certain impurities.

Gases and other volatile impurities which are in simple solution or in the form of unstable compounds are relatively simple to remove, to a degree depending on the square root of the partial pressure of the gas. Stable compounds such as oxides in steel must be reduced to form gaseous products. Choice and use of refractories are important, since many may dissociate or be reduced, causing the oxygen level of the molten bath to increase. Considerable care and experience are required to determine the proper techniques for meeting chemistry specifications, to reduce oxygen to a minimum and produce a sound ingot. It may be simply stated that vacuum melting is subject to many of the problems of standard ingot production plus a variety of problems resulting from the use of high vacuum.

Mr. Moore went into detail on the properties of vacuum-melted metals and their advantages. Fabrication properties of most materials are improved. Certain alloys, such as high-chromium irons which normally must be cast, can be hot worked when vacuum melted. Also, vacuum melting is especially useful in the production of very fine wire. There is considerable evidence that properties, such as fatigue life of commercial steels, are improved by the reduction of gases, especially nitrogen.—**Reported by W. P. Benter, Jr., for Canton-Massillon.**

Montana Offers Scholarships

J. R. Van Pelt, president of Montana School of Mines, has announced that the American Smelting and Refining Co. has awarded two scholarships to Montana School of Mines for the year 1954-55, one to a student in mining and the other to a student in metallurgy. The stipends will amount to $500 for each recipient who will be selected between now and the close of the present school year.

Opens Rolling Plant

The Cold Metal Products Co., Youngstown, Ohio, has begun limited operations at their new cold rolling plant at Indianapolis, Ind. A. C. Prudner, who has been associated with Cold Metal Products for more than 13 years, is plant manager for the new operation, which has been equipped for the production of specialty items of carbon and alloy cold rolled strip steel.

Heat Treat Panel Speaks in Boston

At a Recent Meeting of the Boston Chapter a Panel of Experts Discussed "Heat Treating Equipment". The panel consisted of, from left: S. M. Baylor, chairman; Charles A. Mueller, assistant director of research, Lindberg Engineering Co., who spoke on "Furnace Equipment"; W. F. Collins, United Carr Fastener Co., panel chairman; L. B. Rosseau, vice-president in charge of sales, Ajax Electric Co., who discussed "Salt Baths"; and Joseph F. Libsch, consultant for Lepel High Frequency Laboratories, who discussed "Induction Heating". (Reported by R. A. Pomfret)

Carolinas Sustaining Members Hear Knerr

Sustaining Members of the Carolinas Chapter Who Heard Horace C. Knerr, Metlab Co., Speak on "How the Metallurgist Can Aid Industry" Included, From Left, Seated: G. H. Ballentine, Jr., Precision Machine Works; F. F. Rose, Edgcomb Steel Co.; C. J. Tuller, Wilkins and Matthews; E. R. Talone, John P. Clark Co.; and M. R. Thomas, A. B. Carter, Inc. Standing, from left, are: Red Cook, Metlab Co.; Paul A. Moody, Western Electric Co.; J. R. Huntley, Tool Service Engineering Co.; Brice Windle, Henry Walke Co.; Ray R. Triplette, Allied Tool and Machine Co.; and E. S. Davidson of the Davidson Engineering Co.

Speaker: Horace C. Knerr
Metlab Co.

Horace C. Knerr, president of Metlab Co. and former chairman of the Philadelphia Chapter, was guest speaker at the Sustaining Members Night meeting of the Carolinas Chapter held recently.

Drawing on his background as a consulting metallurgist and commercial heat treater, Mr. Knerr gave a talk on "How the Metallurgist Can Aid Industry". He stressed that the metallurgist should be an active member of the industrial team. Metallurgical advice is needed from the drawing-board stage until the product leaves the plant, but the metallurgist's help is seldom sought unless trouble occurs.

Many metallurgical failures are caused *before* heat treating by poor design, improper specifications of materials, mixed material, etc., rather than failure to heat treat properly. Since heat treatment is usually one of the last operations, an accumulation of errors along the line often results in blame being put on the heat treater, who is invariably adjudged guilty until he proves himself innocent.

According to Mr. Knerr, it is common practice to ascribe all troubles to improper heat treatment. He related several humorous "detective stories" of how he had been able to refute claims against his company for allegedly damaging a customer's work. The commercial heat treater must often resort to prior nondestructive testing of material received for heat treatment to guard against imperfections due to previous work or defective material.

In conclusion, Mr. Knerr emphasized how important it is to have sound metallurgical advice at all stages of manufacture in order to assure a good product. Lack of such advice results in wasted time and money.—**Reported by Moss V. Davis for the Carolinas Chapter.**

Columbus Lectures on Metallurgy for Metal Fabricators Completed

The Columbus Chapter has recently completed an educational series of four lectures on "Metallurgy for Metal Fabricators". The first lecture was on April 5, the concluding lecture on April 19. Topics included:

"Principles of the Deformation of Metals", by S. L. Hoyt, consultant, Battelle Memorial Institute.

"Heat Treating and Hot and Cold Forming", by R. E. Christin, Electric Heat Treating Co.

"Fundamentals of Joining Metals", by R. S. Green, chairman, department of welding engineering, Ohio State University.

"Specific Methods of Welding Metals", by C. B. Voldrich, Battelle Memorial Institute.

Attendance was open to all technical people, and those completing the course of four lectures were given certificates for attendance. Roland Fischer, Battelle Memorial Institute was chairman.

Describes Processes for Welding Stainless Steel

Speaker: Harry F. Ried, Jr.
McKay Co.

The Kansas City Chapter heard Harry F. Ried, Jr., manager of the technical service division, McKay Co., speak on "Welding of Stainless Steel" at a recent meeting.

Mr. Ried gave an interesting and complete discussion of the selection of the proper electrode and heat for several stainless applications. He supplemented his talk with films.

A short discussion of the manufacture of electrodes was given in which the thorough quality control of both wire and coating was stressed. Mr. Ried also described the methods of coating electrodes.—**Reported by R. D. Scrom, Jr., for Kansas City.**

THIRTY YEARS AGO

The name of KOTARO HONDA, venerable dean of Japanese metallurgy who died this year, appears for the first time in the *Transactions* A.S.S.T. (now A.S.M.), as author of an article on "The Theory in Quenching Steels" in the October 1923 issue.

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Advantages of the big-end-up ingot mold were introduced to A.S.S.T. members in the February 1924 issue of the Society's *Transactions*, by way of a paper by EMIL GATHMANN, vice-president and general manager of Gathmann Engineering Co., Baltimore (deceased; represented on the A.S.M. membership roll by his son, EMIL GATHMANN, JR.).

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On Jan. 1, 1924, N. M. Salkover resigned as metallurgist for R. K. LeBlond Machine Tool Co., Cincinnati, to organize his own company known as Metallurgical Service Co. (a firm still very active in the field as Salkover Metal Processing Co.).

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Winter and spring sectional meetings of the Society were held in 1924, the winter meeting in Rochester, Jan. 31 and Feb. 1, and the spring meeting at Moline, Ill., May 22 and 23, with Tri-City Chapter as sponsor. J. J. DESMOND, chairman of the Rochester Chapter (now chief metallurgist, Delco Appliance Division, General Motors Corp.) and H. BORNSTEIN, chairman of the Tri-City Chapter (now retired) headed the respective arrangements committees.

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The March 1924 issue of the *Transactions* carries a photograph of the first woman to become a member of the Society—namely, Miss ETHEL M. BAILEY, in charge of material testing for the L.W.F. Engineering Co., Inc., College Point, New York.

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A note in the April 1924 issue of the *Transactions* announces that A. D. BACH "has resigned from the Cleveland office of the Atlas Steel Corp., to join the steel sales department of Henry Disston & Sons, Inc. in the New England territory". Mr. Bach, a past chairman of the Boston Chapter, is now president of New England Metallurgical Corp.

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The Golden Gate Chapter of the Society was organized in April 1924 with a total of 102 charter members. Temporary chairman and secretary, respectively, were ARTHUR N. ARMITAGE of Columbia Steel Corp. (retired) and D. HANSON GRUBB, still secretary of the Pacific Scientific Co.

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Changing times department: An editorial in the August 1923 issue of *Transactions* decried the low wages paid to the metallurgical profession ($200 to $250 a month for a skilled graduate engineer). Today it is one of the best paid of the engineering professions, according to research by the A.S.M. Advisory Committee on Metallurgical Education.

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The new slip interference theory of hardening proposed by ZAY JEFFRIES (now retired) and R. S. ARCHER (now vice-president, Climax Molybdenum Co.)—both A.S.M. past presidents—is described in an extensive paper in the September 1923 issue of the *Transactions*.

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The first subcommittee reports of the Standards Committee (predecessor of the present-day Metals Handbook Committee) are published in September 1923 and include a "Tentative Recommended Practice in the Heat Treatment of Toolsteel" and also one for the heat treatment of 18% tungsten high speed steel. WILLIAM J. MERTON, metallurgical engineer for Westinghouse Electric & Mfg. Co. (now deceased) was chairman of the subcommittee on heat treatment of toolsteels which was responsible for this work.

High-Temperature Alloys Subject at Phoenix Meeting

Speaker: Glenn A. Fritzlen

Haynes Stellite Co.

Glenn A. Fritzlen, assistant technical director, Haynes Stellite Co., spoke to about 50 members and guests at a recent meeting of the Phoenix Chapter on "High-Temperature Alloys". Slides comparing the various high-temperature alloys clearly illustrated points made by the speaker. A discussion period on research being done in this field concluded the meeting.—**Reported by Jim Sager for Phoenix.**

Golden Gate Lectures On Corrosion Resisting And Hard Facing Metals

Speaker: G. A. Fritzlen

Haynes Stellite Co.

The Golden Gate Chapter recently heard Glenn A. Fritzlen, assistant technical director, Haynes Stellite Co., speak on "Corrosion Resisting and Hard Facing Materials". Mr. Fritzlen's experience with his company covers over eight years in metallurgical research and development of high-temperature and corrosion resistant alloys.

Mr. Fritzlen gave a most interesting and instructive talk in which he discussed special metallic corrosion resistant products with iron, nickel and cobalt bases. He explained the constitution and electrochemical theories covering the nobility of metals and classified the principal ingredients and their relative effect on nobility.

The stainless steels of both martensitic and austenitic composition were discussed in detail. Their passivation, film formation, and reaction to heat and corrosive exposure were also explained.

The relation between these metals and hard facing materials and many typical applications of both products were illustrated with excellent slides.—**Reported by Gordon von Planck for Golden Gate.**

Appoints New Representative

Waltz Furnace Co., Cincinnati, Ohio, has announced the appointment of Charles J. Paumier as their new West Coast representative in Los Angeles, Calif.

Waltz manufactures a wide variety of furnaces for industry, for all types of metal processing, including heat treating, carburizing, annealing, brazing, drawing, enameling, flattening and tempering.

Speaks at Tulsa Past Chairmen's Night

Shown at the Tulsa Chapter's March Meeting Are, From Left: Ted Duncan, Chapter Chairman; Walter O'Bannon, Jr., Past Chairman (1945-1946); G. A. Fritzlen, Who Spoke on "Special Alloys for Corrosion, Abrasion and High Temperature"; J. C. Holmberg, Past Chairman (1952-1953); and Homer Garrison, Past Chairman (1951-1952). (Reported by T. N. Duncan for Tulsa)

Repeats Campbell Lecture at Los Angeles Young Fellows Night

Speaker: Donald S. Clark
California Institute of Technology

Donald S. Clark, professor of mechanical engineering, California Institute of Technology, presented the 1953 Edward De Mille Campbell Lecture, originally presented at the annual meeting of the A.S.M. in Cleveland, before the Young Engineers Night meeting of the Los Angeles Chapter. The talk was entitled "Behavior of Metals Under Dynamic Loading". Prof. Clark limited his talk to the manner in which metals respond to stresses imposed in a short period of time as compared with the relatively long time that is involved in what is commonly referred to as static loading.

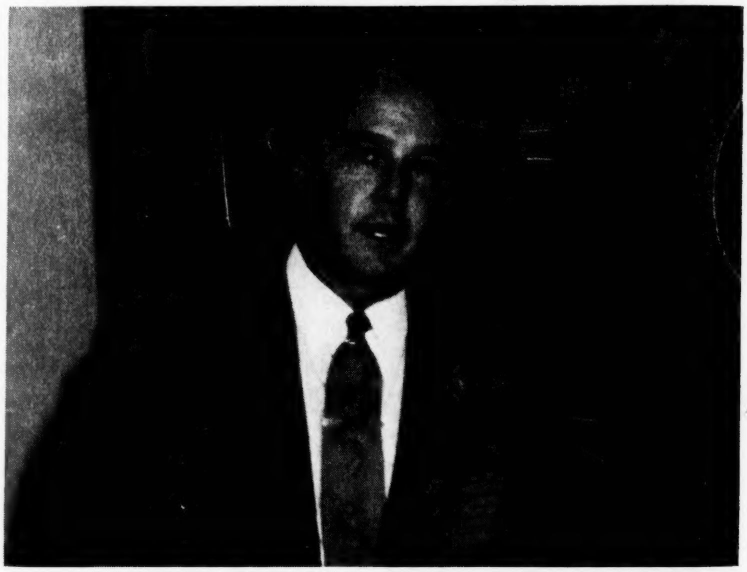
Prof. Clark stated that a distinction between impact and rapid loading is important. In an impact type of loading, the inertia of the metal itself strongly influences the mode of deformation, while in rapid loading the load is applied more gradually so that the inertia is not important. Dynamic behavior first appeared in the literature in 1800, and since that time engineers have been devising tests to provide data for design of metal components to dynamic loading.

Prof. Clark discussed the progress that has been made in trying to explain certain phases of the dynamic behavior of metals. In 1942, indirect evidence indicated that the stress-strain relation was higher under dynamic conditions than static conditions and this would account for the difference between the calculated and the experimental strain distribution. Until recently attempts to obtain a stress-strain relation during impact have not considered the strain propagation phenomenon. In 1953, compression impact tests on long aluminum rods showed a definite increase of the stress-strain curve by about 15 to 20% to higher values of stress for a given strain in the plastic region. Another evidence of a higher stress-strain relation is in the tension impact test where the maximum stress to which a metal may be subjected before failure occurs is greater under dynamic than static conditions. In addition, most metals exhibit greater total elongation to failure under impact up to a certain impact velocity than under static loading. Prof. Clark explained the existence of a critical impact velocity of a metal which may be of importance in some applications and showed slides with data on various steels, copper, aluminum and magnesium alloys.

In special tests performed at the California Institute of Technology, it was observed that stresses above but near the static upper yield point for low-carbon steel could be maintained for a reasonably long time before the specimen yielded; the interval during which the stress was maintained constant before yielding has been called the delay time. A theoretical explanation of the yield point in low-carbon steel was given in terms of dislocations and their interaction with interstitial atoms of carbon and nitrogen.

Prof. Clark concluded that eventually these theories will provide a working basis for the practicing design engineer but, until that time, the metallurgists and engineers must utilize standard testing and experience.—**Reported by A. P. Binsacca for the Los Angeles Chapter.**

Talks on Induction Heating at Purdue



Harry B. Osborn, Jr., Technical Director, Tocco Division, Ohio Crankshaft Co., Spoke on "Induction Heating" at a Meeting in Purdue. Induction heating was described in detail and some slides illustrating applications shown. (Reported by Leonard J. Ewalt for Purdue Chapter)

R.P.I. Science of Metals Club to Hold Symposium

The Science of Metals Club of Rensselaer Polytechnic Institute sponsored a symposium on "Some Recent Developments and Techniques in Metallurgical Research" on May 8. The symposium, presented in two sessions, morning and afternoon, featured a luncheon honoring Arthur A. Burr, professor of physical metallurgy and faculty advisor of the Science of Metals Club. The luncheon address was given by Matthew A. Hunter, dean emeritus of faculty and founder of the department of metallurgical engineering at Rensselaer.

The following papers were presented, each followed by a discussion period.

Internal Friction in O-Ta and O-V Solid Solutions, by R. W. Powers, General Electric Research Laboratory.

Potential Applications of an X-Ray Microscope to Metallurgy, by S. P. Newberry, General Electric General Engineering Laboratory, Electron Optics Unit.

Application of a High-Speed, Time-Temperature Control to Metallurgical Problems, by W. F. Savage, Rensselaer Polytechnic Institute.

Deformation of Highly Perfect Crystals, by R. L. Fullman, General Electric Research Laboratory.

Plastic Deformation of Sapphire, by M. L. Kronberg, General Electric Research Laboratory.

Heterogeneous Nucleation in Martensite, by R. Cech, General Electric Research Laboratory.

The R. P. I. Science of Metals Club is in part sponsored by the Eastern New York Chapter A.S.M.

Correction

In the presentation of the meeting program awards which appeared on p. 30 of the April issue of *Metals Review*, an error was made in the order of the prizes awarded, which were announced in reverse order. They should have read as follows:

Chapters Over 500 Members: (1) Los Angeles. (2) Philadelphia. (3) New York. Chapters With Less Than 500 Members: (1) Manitoba. (2) Warren. (3) Springfield.

Detroit Presents Metal Casting Series

Richard Schneidewind, Professor at the University of Michigan, Presented the First Lecture of the Recently Held Educational Series on "Metal Casting Fundamentals" in Detroit. Shown above, from left, are: Ray Dhue, E. F. Houghton & Co., technical chairman; Professor Schneidewind; and Richard Chapman, chairman of the Detroit Chapter's Educational Committee

The Detroit Chapter has recently completed an educational course on "Metal Casting Fundamentals". R. D. Chapman, educational committee chairman, and his committee enlisted the aid of a group of experts from the field of foundry education to present the coordinated series.

Cast Metals and Their Properties

Richard Schneidewind, professor of metallurgical engineering, University of Michigan, presented the first lecture, "Cast Metals and Their Properties". He showed the influence of composition on fluidity of molten metals, undercooling and solidification. Using the aluminum-silicon and various copper systems as examples, he showed that a narrow freezing range composition is more fluid than one of wide range and stated that such compositions are chosen for intricate shapes and die castings.

In the cast ferrous alloys, he showed the effect of undercooling by referring to a study of annealed irons cooled at various rates. Fluidity in iron-carbon-silicon alloys is similar to simpler systems if use is made of the "carbon equivalent"; fluidity reaches a maximum at a composition equivalent to slightly beyond the iron-carbon eutectic.

The speaker likened cast iron to steel weakened by graphite, but graphite may often be useful; in brake drums, for example, it lessens heat distortion, and in piston rings it may prevent scuffing.

Nodular iron has the advantage that section size is not limited and that strengths are similar to steel; disadvantages are high shrinkage, low alloy efficiency and costly alloy additions.

The choice between malleable and nodular iron is one of economic conditions existing in a particular plant.

Among some interesting techniques in the study of cast iron, Dr. Schneidewind mentioned the use of an S-curve (isothermal diagram) for solidification of gray iron. In discussing cast irons, he covered the techniques of inoculation, control of mottled zone in chilled irons and he listed some of the important types of alloyed irons.

Casting Methods

The second lecture on "Casting Methods" was given by Kenneth F. Packer, instructor in production engineering, University of Michigan. Mr. Packer is currently combining graduate research in metallurgy with industrial research and a full teaching schedule in foundry practices. He discussed some of the fundamental work being done on solidification of cast metal, illustrated by formulas and curves.

Mr. Packer described briefly some of the conventional techniques, such as sand casting, and then gave more detail on newer techniques, such as shell molding. Samples were displayed to illustrate the different casting techniques.

Analysis of Casting Defects

The final lecture on "Analysis of Casting Defects" was given by William A. Hambley, consulting engineer in foundry practices. Mr. Hambley was for six years chairman of the American Foundrymen's Association committee on defects in gray iron which prepared a book on the subject.

The speaker classified as major defects those in which the casting cannot be salvaged. Secondary defects are those in which the casting may be salvagable but there is a question as to whether it is less expensive to remake the casting. Minor defects are those which can be repaired, but require extra handling and add to the cost of the casting.

Mr. Hambley emphasized the importance of awareness and intelligent action on the part of management, the need for shop supervisors to advise management of places where scrap may be reduced and to train their men to do the job in such a way that carelessness does not constitute a scrap factor.

Mr. Hambley distributed a compilation of casting defects and operating factors to those present. He asked the audience to fill out a chart entitled "Analyzing a Casting Defect", and in a reveiw of each common defect he pointed out those operating factors which could contribute to that defect and emphasized the major causes for each.

Each registrant for the course received a copy of the A.S.M. book "The Structure of Cast Iron" by A. Boyles, and copies of "Fundamentals of Steel Casting Design" and "Developments Concerning the Properties of Cast Steels". The latter two books were furnished by the Steel Founder's Society. Certificates from the A.S.M. were awarded to those completing the course of three lectures.—**Reported by D. V. Doane and N. F. Spooner for the Detroit Chapter.**

Tri-City Gives Course On Protective Finishes

"Application and Technology of Protective Finishes" was the title of a series of four educational lectures recently completed by the Tri-City Chapter.

A talk on "Protective Chemical Treatments for Ferrous Metals", by R. C. Gibson, technical director, Parker Rust Proof Co., covered the preparation of metal surfaces by organic solvent, alkaline, emulsion, pickling and mechanical cleaners; chemical coatings such as the phosphates; and paint tests.

"Protective Treatments for Nonferrous Metals", by R. F. Hafer, finishing engineer, products and application department, Reynolds Metals Co., covered anodizing, alodizing and protective treatments for aluminum and magnesium.

In a discussion on "Rust Preventatives", C. A. Hutter, chief chemist, rust preventional laboratories, Nox Rust Chemical Corp., discussed dip-type rust preventatives including drying, oily, pigmented and special types, and paper-wrapper types.

"Organic Finishes and Methods of Application", by A. Brolin, assistant director, technical sales department, Sherwin-Williams Co., included discussions of the new synthetic resins, rubber-base coatings, the advantages and applications of various materials, and methods of application.

Talks on Malleable Iron Castings at Rochester Meeting

Speaker: James H. Lansing
Malleable Founders' Society

"Malleable Iron Castings" were discussed by James H. Lansing, technical and research director of the Malleable Founders' Society, at a meeting of the Rochester Chapter.

Mr. Lansing's presentation dealt primarily with the American Malleable Iron-A. S. T. M. A47 specifica-tion and covered the following topics: Definition, properties, origin, requirements for malleablizing, sequence of steps in the production of malleable iron castings, types of melting and annealing furnaces used and uses. He also discussed production methods and advantages of pearlitic castings as produced to A.S.T.M. specification A220.

Mr. Lansing stated that Europe produces chiefly white-heart malleable iron by a decarburiziation cycle, whereas the U.S. produces mainly black-heart malleable iron by an annealing cycle. The European product is practical in relatively thin sections only and has the advantage of weldability, whereas the U.S. product has no such restriction on section thickness. In general American malleable iron has higher physical properties than European.

Because of a unique metallurgical structure, malleable iron possesses properties which, by reason of their combination in one metal, establish it as an ideal material for a wide diversity of applications. Chiefly these properties are: Toughness, excellent resistance to heavy and repeated impact, excellent ductility, good corrosion resistance, easy machinability, good low-temperature properties and a versatile castability that makes possible sound castings, accurate to pattern, in complicated as well as simple forms, over an extensive range of weights and sizes.

An important requirement for malleablizing is that all of the carbon must be in the combined form prior to annealing. This is accomplished by balancing the composition.

Melting may be direct in a reverberatory or electric furnace or a duplex method of operation may be used in which either a reverberatory or electric furnace is charged with solid or liquid metal from a cupola. The latter method provides a continuous basis of operation.

The duration of annealing cycle depends on the time required to come up to heat. It varies with the furnace type as follows: Old annealing furnaces, 2 days; gas-fired radiant tube atmosphere controlled furnaces, 1½ days.

Malleable iron use is found widespread in automotive, farm machine, ordnance fields, etc.

Mr. Lansing supplemented his talk with a color movie, "This Moving World", which adequately depicted the making, testing and uses of malleable iron. Mr. Lansing collaborated in the production of this film.

The meeting, which was designated "Educational Recognition Night" honored those who had satisfactorily completed the Chapter's fourth annual educational course conducted this past fall. The course consisted of a seven session lecture-movie series covering the various "Elements of Metal Processing". It was reported that 86 people had satisfactory attendance and, in view of this fact, certificates of satisfactory participation were being mailed by the Chapter to each individual.—**Reported by Sydney Gamlen for the Rochester Chapter.**

British Columbia Hears Story of Stainless Steel

Speaker: T. R. Lichtenwalter
Republic Steel Corp.

The British Columbia Chapter heard T. R. Lichtenwalter, Republic Steel Corp., tell the story of "Stainless Steels and Heat Resisting Alloys". Mr. Lichtenwalter, the second of the circuit speakers covering the five Pacific Northwest Chapters this season, first showed two movies, "The Story of Stainless Steel" and "Metallurgy Plus", which illustrated the discovery of the properties that made stainless steel in Great Britain and Germany, and how these ideas were brought to the American Continent, further developed and put into mass production as the highest quality of stainless steel as we know it today. The films showed the operations, stage by stage, of the manufacture of stainless steel and sheet.

Mr. Lichtenwalter further expanded on the trials and tribulations that his company and others went through before the highest quality product was achieved. He completed his lecture by answering questions from the audience.

Professor F. Forward of the University of British Columbia presented a certificate awarding an A.S.M. scholarship of $400 to Frank S. Deeth, the top student in his second year of metallurgy at the University. The award is one of many provided by the A.S.M. each year in an effort to promote the best man in the highest field of education pertaining to metallurgy. Mr. Forward gave an account of how the Society has been assisting in furthering education all over the American Continent, and how Mr. Deeth was chosen to receive the award.—**Reported by R. H. Fenton for British Columbia.**

Stump the Experts Panel Meets in Western Ontario

Shown at the Stump the Experts Night Meeting of the Western Ontario Chapter Are, From Left: Trevor Heard, Canada Metal Co., Ltd.; John Perkins, Ford Motor Co.; Howard Wright, Vanadium Alloys Ltd.; Islay Reid, Ford Motor Co.; S. Reeve, Canadian Liquid Air Co.; and R. Waddington, Dominion Forge and Stamping Co.

New Films

What's a Silicone?

A 32-min. sound-color 16-mm. film produced by the Dow Corning Corp., and designed for engineers, shows what silicones are and how they can be used to advantage. It begins with the structure of these materials and demonstrates the properties of silicones as compared to organic materials. The film is available to interested persons who should write to: DeForest Walton, Technical Information Service, Dow Corning Corp., Midland, Mich.

Allis-Chalmers Films

Three slidefilms entitled "In Every V-Belt Drive", "For Better Driving" and "Selecting a Drive" have recently been prepared by the Allis-Chalmers Manufacturing Co. The first, in color, covers the engineering principles that are basic in every v-belt drive application; the second is concerned with the installation and maintenance of multiple v-belt drives; and the third tells how to check characteristics to find the best type of drive and then engineer it to do the job. The films are available through Allis-Chalmers General Machinery Division district offices.

At This Moment

Westinghouse Air Brake Co.'s new film produced by the Jam Handy Organization is in full color. The film captures the excitement of life on the railroads, from the yards out over the country, from New England and the Eastern Seaboard, across the Mississippi country and the Middle West, through the Great Plains and the Rockies and on to the Pacific Coast. Audiences receive an impressionistic view of the country's economic activity: produce, raw materials, manufactured parts, machinery and products, threaded together to form a pattern determined largely by the railway system of the country. Write: Publicity Dept., Jam Handy Organization, 2821 East Grand Blvd., Detroit 11, Mich.

Aluminum in the Skyline

America's first aluminum skyscraper, the 30-story Alcoa Building in Pittsburgh, is the subject of this 28-min. motion picture recently completed by the Aluminum Co. of America. The film, which was made over a period of three years, points up construction features, design and fabrication of the curtain wall panels, pivoted reversible windows, radiant-heating ceiling, plumbing, wiring and hardware and ornamental trim, all of aluminum, from basement to penthouse. Prints may be obtained by writing: Alcoa's Motion Picture Dept., 722 Alcoa Bldg., Pittsburgh 19, Pa.

Speak on Hot Brass Pressing in Canada

From Left Are Paul B. Crowley and Walter Irwin, Canada Metal Co., Ltd., Who Gave a Joint Talk on "Hot Brass Pressings" at a Meeting in Western Ontario, and Percy E. Banwell, Walker Metal Products Co., Chairman

Speakers: Walter Irwin
Paul Crowley
Canada Metal Co., Ltd.

The Western Ontario Chapter heard of a new process for making brass parts in a talk on "Hot Brass Pressing" given jointly by Walter Irwin, foundry division, and Paul Crowley, pressing division, Canada Metal Co., Ltd.

The background and history of the operation, which was brought from England, was presented by Mr. Irwin. He noted that the process has been carried out in England for the past 30 years and is presently being used in Toronto.

Several of the outstanding features of hot brass pressing are the close tolerances held from the die, absence of flash, high finish suitable for plating and finishing operations and ability to insert cores in several planes in one operation.

Mr. Crowley showed samples of the work being done at Canada Metal Co., and drew comparisons with other methods of manufacture such as casting and automatic screw machine processes.

He said that the majority of production is from extruded brass forging rod but other alloys have been used satisfactorily where additional strength or wear resistance is required.—**Reported by Trevor Heard for the Western Ontario Chapter.**

Extractive Metallurgy Discussed at Buffalo

Speaker: Marvin J. Udy
Consulting Engineer

Almost unnoticed, antimony is constantly finding new markets and increasing in importance. Production has been steadily rising, and aggressive research has developed many new uses. Marvin J. Udy, consulting engineer, explained this and other "Recent Developments in Extractive Metallurgy" in Buffalo recently.

Commonly found in gold ore, antimony is mined and extracted in the Western United States. Obtaining the element in a satisfactorily pure form has proved a problem, for only slight contamination makes it useless for many applications. Electrolytic refining results in a purity of 99.99% and further refining by zone melting gives even higher purity.

Prominent uses of antimony include an alloy with aluminum which is used for semiconductors in the electronics field and fireproof paint containing antimony oxide. Antimony is also electroplated on steel to increase corrosion resistance. Articles so plated were exposed to the Detroit industrial atmosphere for one year with excellent results.

The dinner and technical session followed a tour through the Schoellkopf Hydro Power Station at Niagara Falls, N. Y.—**Reported by A. E. Leach for Buffalo.**

Metallurgical News and Developments

A new monthly feature, Metallurgical News and Developments, starts on p. 20 of this issue of *Metals Review*. It is intended primarily to bring items of interest to pre-engineering students and students in metallurgy in brief form, and will cover news and related items in the field in which the student will eventually work.

Metallurgical News and Developments

Research Symposium

A course on how scientific methods may be applied in solving industrial, business and government problems will be the subject of a two-week summer program to be given at Massachusetts Institute of Technology from June 16 through June 19. A similar symposium, sponsored by the Midwest Research Institute, was held on April 8-9 in Kansas City, Mo.

Using Low-Grade Ores

The state legislature of Michigan is being asked to appropriate $723,000 to build a research laboratory for metallic ores at the Michigan College of Mining and Technology, Houghton, to explore ways to beneficiate the low-grade iron ores in Michigan, estimated to be more than 720-million tons.

TV Cameras

Thompson Products, Inc., Cleveland, is planning to move into the television camera field with the purchase of Dage Electronics Corp., Beach Grove, Ind. Thompson now makes parts for aircraft, automotive and electronic equipment.

New Line of Stainless

The Chase Brass & Copper Co. has announced that it will soon begin to merchandise stainless steel in sheet, bar, wire and tube on a national basis.

Aluminum Chairs

Shielded inert-gas welding is being used by the Barcalo Manufacturing Co., Buffalo, N. Y., to help speed production of 1200 aluminum deck chairs to be used aboard the S. S. United States. The chairs are made from extruded aluminum tubing.

French Aluminum Record

French aluminum output hit a record 112,500 tons in 1953, 6000 tons more than 1952. Most of the metal made by the two producers, Pechiney and Ugines, went to Britain and the U. S. and exports amounted to 44,000 tons. The domestic market took only 76,000 tons, as against 90,000 in 1952.

Sound of the Jet Age

The Navy is working on a helmet to protect the ears of men working around jet planes. Four plane makers in the Los Angeles area have already spent $2,752,000 on equipment to muffle the sound of jet warm-ups.

Cement Mortar

A cement mortar that resists most acids and alkalies has been introduced by the Pennsylvania Salt Manufacturing Co., Philadelphia. It will be used for industrial construction and the maintenance trades.

Rocket Lab

A rocket laboratory has been completed by Purdue University, at a cost of $100,000. The laboratory has been specially designed for instruction in basic research activities, and will be used by graduate students on such problems as combustion properties of rocket fuel, motor cooling and rocket combustion.

Perfect Crystal

General Electric Co. has announced the development of perfect crystals of pure iron. These crystals are reported to be 100 times stronger than any metallic crystal and inherently resistant to rust. They represent, for the first time, metals that are as strong as theory predicts they should be.

Fire Brick Products

Refractory fire brick and clay products, used in steel plants and metal refineries, will be produced by H. K. Porter Co., Inc., Pittsburgh, maker of hydraulic presses, wire and forged steel fittings. Porter will buy the six refractory plants of the McLain Fire Brick Co., Pittsburgh.

Computing Service

Mathematical Computing Service, Bayside, N. Y., specializes in performing services for industries desiring engineering calculations, charts and nomographs of a high degree of complexity and the treatment of related mathematical problems in the field of metallurgical engineering. Staff consists of consultants who are qualified to treat problems in applied mathematics related to the physical sciences.

Analytical Process

An analytical process which shows promise of being fast enough and accurate enough to study hydrogen during steelmaking has been installed at the United States Steel Research and Development Laboratory, Pittsburgh. The gases evolved from a steel sample can be analyzed for hydrogen by means of a thermal conductivity cell. This technique makes possible the analysis of a properly prepared sample in about 15 minutes with a probable error of only ± 0.12 parts per million.

Titanium Analysis

A titanium analysis section has been created at Sam Tour & Co., Inc., New York City. This section, part of the Chemical Division of the company, is prepared to handle requests for routine and control analysis for numerous elements in titanium metal and alloys.

Atomic Power Agreement

Vitro Corp. of America, oldest continuing company in the atomic energy field, is one of the 26 project companies of the Dow-Detroit group which has signed a contract with the Atomic Energy Commission to continue research and development on breeder reactors for generation of electric power and other products.

Ceramics Course

A special two-week summer program will be given on applications of "High-Temperature Ceramics" at Massachusetts Institute of Technology, Cambridge, Mass., from July 19 through July 30, 1954. The program will deal with the application, development and properties of ceramic materials. Developments in techniques will be stressed.

Pilot Plant

Westinghouse Electric Corp. is breaking ground for a plant at Blairsville, Pa., to study new metals and metallurgical processes on pilot plant scale—a necessary step between the research laboratory and tonnage production. Completion is expected by mid-7955. All necessary melting, casting, forging, heat treating and surface-finishing equipment will be installed to fabricate small lots of newly developed alloys and parts for electrical and electronic equipment, jet propulsion and atomic power.

Resistance Welders

The Resistance Welder Manufacturers' Association has announced the appropriation of funds for grants-in-aid to worthwhile university researchers to secure basic information of value to the resistance welding industry and to encourage the training of young men in resistance welding research. The first grant will be for research on the subject, "Spot Weld Aluminum With Single Phase, 60-Cycle Current".

Students Honored at Meeting in Milwaukee

Attending the Milwaukee Chapter's Annual Student Night Meeting Were a Group of Metallurgical Engineering Students From Marquette University (Above) and a Group of Students from University of Wisconsin

Speaker: Herman P. Rassbach

Electro Metallurgical Co.

"Progress in Electric Furnace Melt- and the Future of Alloy and Stainless Steels" was the title of a talk presented by Herman P. Rassbach, assistant manager, technical sales and development department, Electro Metallurgical Co., at the Students Night Meeting of the Milwaukee Chapter.

The speaker's early experiences in melting of openhearth and electric furnace alloy steels for heavy forgings, castings and a wide variety of wrought products qualify him to focus his present interests in the technical work related to improving economics in the production of stainless steels. Mr. Rassbach discussed some of the early melting problems and reviewed developments leading to lower usage of critical materials. The future outlook of the electric furnace and its economic position relative to the openhearth were discussed.—**Reported by E. H. Schmidt for the Milwaukee Chapter.**

Pennsylvania Chapters Plan Biennial Meeting

The Ninth Biennial Pennsylvania Interchapter meeting of the American Society for Metals will be held at Pennsylvania State University on June 18 and 19, with the Penn State Chapter and the College of Mineral Industries of the University as hosts. Participating chapters are Lehigh Valley, Northwest Pennsylvania, Philadelphia, Pittsburgh and York.

The first of four technical sessions will feature an address on "New Developments in Metallurgy" by Bruce S. Old, who will be introduced by James B. Austin, national president A. S. M. On the afternoon of the 18th two sessions will run simultaneously, one on "Iron and Steelmaking," under the chairmanship of J. J. Munns of Weirton Steel Co., the other on the "Shaping of Metals," with E. H. Dix, Jr., Aluminum Co. of America, as chairman.

The final session will be presided over by Jerome Strauss, Vanadium Corp. of America, and will be devoted to papers on the "Boron Hardenability Effect", "Rare Earths in Stainless Steel" and "Development of Spheroidal Graphite During Freezing of Magnesium-Treated Cast Irons".

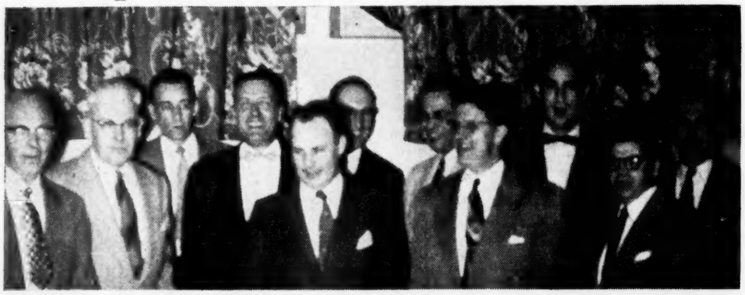
Leaders of outstanding authority have agreed to participate in discussions of each paper.

A banquet on Friday, June 18, will honor Edgar C. Bain, assistant to the president, U. S. Steel Corp., past-president A. S. M. (1937), Henry Marion Howe Medalist (1931), Sauveur Achievement Award (1946), A. S. M. Gold Medal (1949), and Campbell Memorial Lecturer (1932).

Student Wins Scholarship

Richard H. Bush, Stanford University sophomore studying metallurgy, has received a plaque from the Golden Gate Chapter A. S. M. to mark his winning a Society scholarship grant this year. The grant is made annually to an undergraduate to stimulate interest in metallurgical studies.—*From the Stanford Alumni Review.*

Complete Plans for Regional Meeting



Worcester Chapter Was Host to the Final Planning Session for the New England Regional Conference Which Was Held in Providence on May 14. Worcester members met with the officers of the Providence, Springfield, Hartford and Boston Chapters. (Reported by C. Weston Russell for Worcester)

Methods of Manufacturing Diamond Drills Outlined

Speaker: John Booth

Boyles Bros. Drilling Co. Ltd.

John Booth, mechanical engineer for the Boyles Bros. Drilling Co. Ltd., discussed "Materials Used in the Manufacture and Production of Diamond Drills" before a meeting of the British Columbia Chapter.

Mr. Booth described the diamond as the hardest substance known to man. World production of diamonds in 1950 was 15,262,033 carats, 79% of which went to industrial use.

In making a drill bit the diamonds are set into a mold to a predetermined pattern, the mold is filled with tungsten powder, the steel bit blank is placed on the tungsten and around this is placed a carbon ring filled with pellets of a nonferrous alloy. This assembly is placed in an electric furnace and held at 2100° F. for 35 min. The alloy forms a matrix with the tungsten, binding the diamonds, tungsten powder and steel bit blank together. The assembly is given a light press after it leaves the furnace and the final machining can be done on the bit blank. After the bit is given a number it is cadmium plated.

The next important part in the drill string is the reamer shell. Reamer shells are short tubular sections mounted between the bit and the corebarrel and are set with diamonds on the periphery. The function of the reamer shell is to maintain the hole diameter so when the new bit replaces the worn out bit it will fit into the hole. Reamer shells are made from 1040 steel with diamond-embedded slugs placed into four or more grooves milled parallel to the reamer shell axis.

A core spring is usually placed in a tapered bore of the bit, small end down. The core spring is tapered on the outside to match the taper of the bit and it is grooved on the inside. It is slotted on one side so it will close in when forced down the taper of the bit. The function of the core spring is to grip the core as the corebarrel is lifted until the core breaks from the rock. It also prevents the core from falling out of the barrel. Core springs are made from heat treated AISI 1040 steel.

The corebarrel usually consists of two seamless steel tubes, one inside the other. The inner tube protects the core from drill water wash.

During the drilling process corebarrels may be subjected to heavy abrasion, and, to reduce wear, particles of tungsten carbide are welded to the corebarrels. Wear is reduced at the top end by using a hardened steel ring, slightly larger than the barrel, known as the guide ring or ferrule.

Drill rods used in diamond drilling have a much larger inside diameter than drills used for percussion drilling. As diamond drill holes descend to depths of 6000 ft., the rods must be light and yet strong enough to transmit the torque required to turn rod and bit, plus the tensile load resulting from the weight of the rods. These rods vary from 1 to 10 ft. in length, 5 to 10 ft. being the most common lengths. The rods have square female threads at both ends. They are shallow in form and have coarse pitch, varying from 3 to 5 threads per inch, depending on the size of the rod. Rods are joined with couplings which have matching pin threads and are arranged for easy handling with a pipe wrench. Drill rods are made of cold rolled seamless 1040 steel tubing and the couplings are AISI 4140 steel. The design of the drill rod joint, from the viewpoint of fatigue, is poor, but little improvement can be made to satisfy *all* essential requirements.

Although diamond drills are used mainly in mining, they are also used to examine rock structures for dams, bridges, buildings, blast holes, excavation projects and oil well drilling.—**Reported by R. H. Fenton for British Columbia.**

Series on Characteristics Of Metals at Birmingham

The March meeting of the Birmingham Chapter was a combination of the regular monthly meeting and the fifth and final lecture of the educational series on the "Characteristics of Metals". Subjects and speakers were:

"What Is a Metal", by J. R. Kattus, senior metallurgist, Southern Research Institute.

"What Are Alloys", by E. A. Brandler, metallurgical engineer, Electro Metallurgical Co.

"What Happens to Metals When Worked", by J. M. Edge, metallurgical engineer, Tennessee Coal & Iron Division of the U. S. Steel Corp.

"Casting Problems", by S. Carter, plant metallurgist, American Cast Iron Pipe Co.

"Control of Corrosion in Metals", by F. L. Whitney, Jr., corrosion consultant, Monsanto Chemical Co.

The lecture series covered the field of metallurgy quite thoroughly in the brief time available.—**Reported by W. P. McCord for Birmingham.**

Douglas Aircraft Men at Tulsa Meetings

The Four Mythologists From the Tulsa Metallurgical Department of the Douglas Aircraft Corp. Attended a Recent Meeting of the Tulsa Chapter. From Left: Dick Sterling, George Freeze, John Tatum and Dale Williams

IMPORTANT MEETINGS
for June

June 3-5—Electric Metal Makers Guild, Inc. 22nd Annual Meeting. Moraine-on-the-Lake, Highland Park, Ill. (C. B. Williams, Secretary, E.M.M.G., Box 6026, Mt. Washington Station, Pittsburgh 11.)

June 6-9—American Gear Manufacturers Association. Annual Meeting. The Homestead, Hot Springs, Va. (John G. Sears, Executive Secretary, A.G.M.A., Empire Bldg., Pittsburgh 22, Pa.)

June 6-11—Society of Automotive Engineers. Summer Meeting. Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J. (John A. C. Warner, Secretary and General Manager, S.A.E., 29 West 39th St., New York 18, N. Y.)

June 7—American Foundrymen's Society. Annual Meeting. Chicago. (W. W. Maloney, Secretary-Treasurer, A.F.S., 616 S. Michigan Ave., Chicago 5, Ill.)

June 9-11—American Society for Quality Control. Eighth Annual Convention. Jefferson Hotel, St. Louis, Mo. (Secretary, Room 5306, 70 E. 45th St., New York 17, N. Y.)

June 9-12—Magnesium Association. Summer Meeting. Seigniory Club, Quebec. (M. I. Hansen, Assistant Secretary, M.A., 122 E. 42nd. St., New York 17, N. Y.)

June 13-18—American Society for Testing Materials. Annual Meeting. Hotels Sherman and Morrison, Chicago. (R. J. Painter, Executive Secretary, A.S.T.M., 1916 Race St., Philadelphia 3, Pa.)

June 16-18—Committee on Vacuum Techniques. High-Vacuum Symposium. Berkeley-Carteret Hotel, Asbury Park, N. J. (C.V.T. Box 1282, Boston 9, Mass.)

June 20-23—National Metal Trades Association. Annual Plant Management Conference. French Lick, Ind. (C. L. Blatchford, Secretary, N.M.T.A., 122 S. Michigan Ave., Chicago 3, Ill.)

June 20-24—American Society of Mechanical Engineers. Semi-Annual Meeting. William Penn Hotel, Pittsburgh. (Ernest Hartford, Executive Ass't. Secretary, A.S.M.E., 29 W. 39th St., New York 18, N. Y.)

June 21-25—American Institute of Electrical Engineers. Summer and Pacific General Meeting. Biltmore Hotel, Los Angeles, Calif. (H. H. Henline, Secretary, A.I.E.E., 33 W. 39th St., New York 18, N. Y.)

Akron Visits Timken

The Akron Chapter visited the main plant of the Timken Roller Bearing Co. in Canton, Ohio, during a recent meeting. About 100 members and their guests went by car and bus from Akron to Canton and after dinner, toured the facilities at Timken.—**Reported by R. E. Miller for Akron.**

Discusses Torpedo Design Developments

Monte Parker (Left), Chairman of the Puget Sound Chapter, and Clint Lundy, Vice-Chairman, Concentrate on a Discussion of "Design and Operation of the Modern Torpedo" Given by H. A. Pieczentkowski, Commanding Officer of the Naval Torpedo Station, Keyport, Wash., at a Recent Meeting

Speaker: H. A. Pieczentkowski
Naval Torpedo Station, Keyport, Wash.

The Puget Sound Chapter heard H. A. Pieczentkowski, U.S.N., commanding officer, Naval Torpedo Station, Keyport, Wash., discuss the "Design and Operation of the Modern Torpedo" at a recent meeting. The Captain, a mechanical engineer who has served in the submarine service of the U. S. Navy for some 20 years, was able to show how the modern torpedo represents the solution of many metallurgical problems.

Capt. Pieczentkowski's discussion pointed up the very real progress made during World War II in working out troubles that have plagued the submarine people since the inception of the torpedo. Prewar torpedoes were very undependable and erratic because of functional problems related to basic materials and mechanisms.

The torpedo, in essence the forerunner of the guided missile, incorporates many of its functional difculties. The turbine-type power plant was limited in efficiency because of lack of high-temperature materials. Emphasis on these materials for missile and jet engine design has speeded the advent of turbine parts which can be operated in the range of 1600 to 1700° F.

Delivery of torpedoes to the target by use of airplane and helicopter called for lighter weight missiles with no decrease in explosive pay load. More and more of the components that were formerly of the heavier metals, such as copper and brass, were replaced by aluminum alloys. The warhead shell of one type torpedo, formerly of steel, has been successfully made from a 220 aluminum base alloy casting.

Water entry shock, due to launching from aircraft at considerable altitudes, still does not allow certain alloy replacements, but the torpedo has come a long way, particularly in the last few years, due largely to better alloys and improved methods of fabrication.—**Reported by Eugene E. Bauer for Puget Sound.**

Dinner-Dance Held by Mahoning Valley Chapter

About 100 members and guests of the Mahoning Valley Chapter attended the annual Ladies Night dinner-dance meeting. The dance, preceded by a cocktail hour through the courtesy of the Electric Furnace Co., and a turkey dinner, featured music and entertainment by the Harmonets. Charles Schultz, Cold Metal Products Co., was social chairman for the meeting.—**Reported by J. D. Anderson, Jr., for Mahoning Valley.**

Chapter Yearbooks Available

All local chapter secretaries of the American Society for Metals have on hand the yearbooks of most of the other chapters. A.S.M. members are at liberty to request the addresses of members and sustaining member companies from their chapter secretaries if the information is available.

Science Teachers Are Presented Awards in ASM-Sponsored Project

Science teachers were honored for their participation in the Third Annual Future Scientists of America Recognition Awards for Science Teachers during the N.S.T.A. National Convention held recently in Chicago. William H. Eisenman, A.S.M. National Secretary, presented the awards to the recipients.

These Science Teacher Recognition Awards are part of the program sponsored by the American Society for Metals and conducted by the Future Scientists of America Foundation of the National Science Teachers Association. The program is a cooperative attempt to encourage teachers who are doing the kind of teaching that keeps boys and girls interested in science and in engineering and scientific careers.

First prize of $400 was won by Edward Victor, head of the science department, Rogers High School, Newport, R. I., for his ideas on how to improve students' study habits. The $300 second prize was granted to Maurice Bleifeld, Newtown High School, Queens, N. Y., who reported on how he helped students to appreciate not only the discoveries and inventions of great scientists, but also their methods and strategy.

A story on how she converted a vacant lot in New York City into a source of field experience thought to be available only to suburban or country children won the third award of $200 for Phyllis Busch, biology teacher, Abraham Lincoln High School, Brooklyn. The fourth-place award of $100 went to Stanley Pearson, in charge of science and mathematics instruction in the Pasadena, Calif., schools, who uses easily-constructed paper models to help his students make sense out of abstract mathematical concepts.

Citations of Merit went to:

Brother Julius George, De La Salle Institute, Chicago.

Carmelitá Barquist, Salem High School, Salem, Oreg.

Clifford Nelson, J. W. Weeks Jr. High School, Newton Center, Mass.

Harriet Brockenbrough, Hermitage High School, Richmond, Va.

J. Edgar Morris, Brown Community High School, Atlanta, Ga.

Philip Goldstein, Abraham Lincoln High School, Brooklyn, N. Y.

Ray Miller, Hunter College High School, New York City.

Jeanne Gelber and Edith Hodges, R. E. Lee High School, Houston, Tex.

Robert Molkenbur, Central High School, Minneapolis, Minn.

Flora Kahme, East Setauket Elementary School, East Setauket, N. Y.

Cites Uses of Hot and Cold Forgings

From Left: T. H. MacIndoe, Vincent Steel Process Co., Technical Chairman, R. G. Friedman, Vice-President, National Machinery Co., Who Spoke on "Hot and Cold Forging", and F. E. Johnson, Timken Detroit Axle Co., Co-Chairman of Papers and Program Committee, Are Shown After the Meeting Which Honored Sustaining Members of the Chapter in Detroit Recently

Speaker: R. G. Friedman

National Machinery Co.

R. G. Friedman, vice-president and assistant general manager of the National Machinery Co., gave a talk on "Hot and Cold Forgings" at the Detroit Chapter's Sustaining Members Night meeting recently.

Mr. Friedman discussed the latest developments in high production hot and cold forging practice on forging presses, cold heading, upsetting and roll forging machines. His talk was supplemented by a movie illustrating forging equipment in various operations.

Of particular interest to Detroiters was the discussion on recent developments in the cold forging of automotive parts. Although automatic cold forging of cap screws and other small parts has been in practice for some 24 years, only recently have applications been made to cold forging larger parts. Wire sizes up to 1½ in. diameter are now being cold forged.

Mr. Friedman pointed out that both hot and cold forging have distinct advantages on certain applications. High costs of equipment required for cold forging of heavy stock make its application to small production jobs uneconomical. However, in many automotive applications, production costs and production schedules have warranted a switch to cold forging.

Cold forged nuts are now being made with only 12% scrap produced from start to finished part as compared to 50% scrap loss on the same part made on a screw machine. High accuracy can be maintained and the finished product is free of scale.

Mr. Friedman emphasized that applications for cold forging have not as yet been scratched. As automation in industry progresses and designers become more familiar with cold forging practice, many items now produced by conventional methods of forging, machining or casting may be more efficiently produced by cold forging.—**Reported by J. M. Herbenar for Detroit.**

Charter Meeting Held by N. E. Pennsylvania Chapter

A successful organizational meeting of the Northeast Pennsylvania Chapter of the American Society for Metals was held in April at the Irem Temple Country Club, Dallas, Pa.

The Charter was presented by A. O. Schaefer, vice-president of Midvale Co., and a trustee of the Society.

The following officers were elected for the coming year: L. P. Clare, Sylvania Electric Products Co., Chairman; J. J. Penkoske, American Car & Foundry Co., vice-chairman; W. Pollack, Sylvania Electric Products Co., secretary-treasurer; F. R. Studer, Daystrom, Inc., arrangements and reception committee; E. C. Brautigam, U. S. Hoffman Machinery Co., membership committee; R. H. Thompson, public relations and publicity committee; F. C. Pierce, Sylvania Electric Products Co., entertainment committee; W. G. Smith, American Car and Foundry Co., education committee; and W. M. Gortner, D. L. & W. Railroad and H. L. MacGregor, American Car and Foundry Co., executive committee.—**Reported by Richard H. Thompson for the Northeast Pennsylvania Chapter.**

Stresses Need to Understand Gas-Metal Reactions

Speaker: E. A. Gulbransen

Westinghouse Research Laboratories

E. A. Gulbransen, advisory engineer, Westinghouse Research Laboratories, presented a talk entitled "Gases in Metals" at a meeting of the Eastern New York Chapter. Dr. Gulbransen has done extensive work on the high-temperature oxidation of metals and alloys, the reaction of hydrogen with metals, combustion of carbon, solid phase reactions and the thermodynamics of high-temperature materials.

The need for a thorough understanding of gas-metal reactions is recognized by those associated with the processing and use of metals. Dr. Gulbransen emphasized the zirconium-hydrogen system since the physics and chemistry of this particular reaction are better understood than any similar reaction and it is representative of many gas-metal reactions.

It has recently been observed that as little as 10 parts per million of hydrogen in zirconium reduces the room temperature impact strength of the metal. Studies have shown that the embrittlement is related to the appearance of a hydride phase in the microstructure of zirconium. Early investigators reported four hydride phases. However, more recent work by the speaker has shown the existence of only two stable phases at low temperatures. An unstable transition phase has been found which is intermediate in structure between the metal and the first hydride phase and its presence may be related to observed changes in the impact strength.

The speaker discussed the mechanism of the reaction of hydrogen with zirconium. Previous workers have found exothermic occluders, such as zirconium, to be inert to hydrogen at room temperature and normal pressures. However, as temperature is increased, there is a temperature at which the reaction with hydrogen begins. Cold work has been found to increase the rate of reaction and the amount of occlusion. These facts have been explained in the past by a rift theory of occlusion in which the expanding and contracting series of rifts govern the occlusion of hydrogen. Thus, heating in vacuum closes rifts and makes zirconium inert to hydrogen.

He showed that oxide films were primarily responsible for the inert character of zirconium to hydrogen. These oxide films can be removed by heating in high vacuo where solution occurs in the metal. For specimens without oxide the reaction with hydrogen occurs rapidly. Studies of the effect of time, temperature, pressure and sample shape show the reaction to be diffusion controlled and not limited by a surface reaction. For oxide-free specimens, no evidence has been found for an induction period or for the phenomena of hysteresis. He summarized experimental work in support of the oxide film theory of the inert character of zirconium to hydrogen under normal conditions of temperature and pressure.—**Reported by John M. Gerken for Eastern New York.**

OBITUARIES

ARTHUR C. MENGEL, chief chemical engineer of the American Locomotive Co., died in March of a heart attack. Mr. MENGEL had been with American Locomotive since 1915. He was chairman of the Schenectady Chapter A.S.M. in 1941.

KARL M. LEUTE, president of the Lithium Corp. of America, Inc., and also president of the Manganese Chemicals Corp., both of Minneapolis, died in March. Mr. Leute was a member of the National Chapter A.S.M.

Presents Talk on Anomalies in Corrosion

Frank L. LaQue, in Charge of Corrosion Engineering, International Nickel Co., Gave a Talk on "Apparent Anomalies in Corrosion" at Chicago's Sustaining Members Night Meeting. Shown are, from left: J. A. Kubik, vice-chairman; O. Zmeskal, chairman; Mr. LaQue; and C. Samans, technical chairman

Speaker: F. L. LaQue

International Nickel Co. Inc.

F. L. LaQue, in charge of corrosion engineering section, International Nickel Co., gave a talk on "Apparent Anomalies in Corrosion" before the Chicago Chapter at their annual Sustaining Members Night meeting.

Rather than trying to review the more well-known theories and types of corrosion damage in the usual way, Mr. LaQue presented some unusual case histories and showed how they were explainable by accepted theories even though they appeared to the contrary on the first examination. He pointed out some fallacies in predicting corrosion behavior based on accelerated laboratory tests and emphasized that the materials and environment for any case constitute their own peculiar problem and cannot always be judged by what is assumed to be a similar problem. The talk was well illustrated by a series of slides.

The speaker discussed the following topics: Case of galvanic corrosion where the least attack was associated with the greatest initial potential difference; corrosion on either inside or outside crevices, depending on circumstances; pitting in some cases because liquids are stagnant and in other cases because they are moving too fast; reduction in corrosion in some cases and acceleration in others by high dissolved oxygen or other oxidizing agent concentration; an increase of corrosion with rising temperature in some instances and a reduction in others; reversals in galvanic potential relationships due to effects of temperature and solution composition; alloys that sometimes are cathodic and anodic to others in galvanic couples; differences in attack due to changes in the relative areas of metals in galvanic combinations; the advantage of painting the noncorroding metal in order to protect the vulnerable one in a galvanic couple; the role of graphite in sometimes retarding and sometimes accelerating the corrosion of cast iron; the peculiar distribution of corrosion of partially immersed steel where the surfaces exposed to the aerated water suffer the least attack; and the reduction of corrosion of steel below low tide in sea water by coupling it to more noble metal in the tidal zone.—**Reported by S. F. Novy for the Chicago Chapter.**

Stainless Families Topic at New Jersey

Shown at the Speaker's Table at a Meeting in New Jersey Are F. B. Poole Technical Chairman, P. A. Frasse & Co., and K. A. Matticks, Crucible Steel Co. of America, Who Spoke on "Drawing and Forming Stainless Steel"

Speaker: K. A. Matticks
Crucible Steel Co. of America

Steel must contain at least 11.5% chromium to be classified as stainless, but may also contain other alloying elements, according to K. A. Matticks, service engineer, Crucible Steel Co. of America, who gave a talk on the "Drawing and Forming of Stainless Steel" in New Jersey.

There are more than 50 grades of stainless steel recognized by the American Iron and Steel Institute, about 20 of which are specifications used in flat rolled products. The speaker confined his remarks to these 20 grades, which represent the complete family of stainless steels.

All stainless steels can be classified into three groups: Straight chromium steels, containing from 11.5 to 18% chromium; straight chromium steels of higher chromium content; and chromium-nickel steels.

The alloys of the first group, types 410, 420 and the several varieties of 440, are all hardenable by heat treatment and are magnetic under all conditions. They have their maximum resistance to corrosion when fully hardened.

The speaker explained that Type 410, the most important steel in the group, is widely used in petroleum refineries for fractionating tower components and for other corrosion resisting applications. Types 420 and 440 are used for valve parts, wear resistant applications and cutlery. Type 440BM, a modified type 440, is the finest stainless cutlery steel available and is equal to chromium-vanadium steel in this application plus being stainless, he stated.

The alloys of the second group, types 430, 442 and 446, are also straight chromium compositions but are not hardenable by heat treatment although they will harden slightly on air cooling. These alloys are also magnetic in all conditions.

The most important alloy in this group is Type 430, which has been widely used to replace 18-8 because of the nickel shortage. It finds its greatest application in decorative trim for automobiles. An average of 42 lb. of stainless is used in each car and 99% of this steel is 430. It has about 50% of the ductility of 302 but can be readily drawn if procedures are modified suitably. However, 430 must be kept clean. It pits much more rapidly than 18-8 if dirt is allowed to remain on the surface and this has caused it to lose favor in some applications. Mr. Matticks pointed out that the shortage of nickel at the mill level is worse right now than during the Korean action.

Types 442 and 446 are heat resisting alloys, the latter being the best oxidation resisting alloy up to 2100° F. of the stainless group. Both are more difficult to form than Type 430.

The chromium-nickel steels comprise the third group. These are the most widely used of the stainless grades. They are nonhardenable by heat treatment and are nonmagnetic in the annealed condition although they become magnetic when cold worked. They have twice the ductility of carbon steels and work harden rapidly.

Types 302 and 304 are used for 75 to 80% of all stainless steel applications. Type 301 was developed for increased work-hardening properties. As an example, half-hard Type 302 is obtained by cold rolling to 25% reduction while half-hard 301 can be obtained by cold rolling to 13%. Thus, 50% less work is required on the mill. The ductility of half-hard 301 is greater than that of half-hard 302 although the reverse is true of the annealed steels. On the other hand, Type 305 was developed to obtain reduced work-hardening rates. This steel is most suitable for spinning.

Types 309, 310, 311 and 314 are heat resisting alloys, the two latter containing 2½% silicon to aid in oxidation resistance but also to inhibit the absorption of carbon by the steel. They are used particularly for annealing pots and covers.

The speaker answered numerous questions during the course of his talk, probably the most interesting being on the use of substitute steels. Manganese is the principal element which can be used as a substitute for nickel. Although several steels in which manganese has been substituted for nickel have been on the market they suffer from two drawbacks, they are more difficult to produce uniformly than the nickel-chromium steels and they are more expensive than 301 or 302. Consequently customers always return to the chromium-nickel steels as soon as they can get them. A new chromium-manganese-nickel modification is under test which will probably cost less than 302.—**Reported by John L. Everhart for New Jersey.**

Aluminum Congress

An American Committee for the Centenary of the Industrial Production of Aluminum has been organized to cooperate with an Aluminum Centennial Congress to be held in Paris from June 14 through June 19, 1954, under the sponsorship of the president of France. The sessions in Paris will include a program of scientific papers from all over the world on latest developments in aluminum metallurgy, the chemistry of aluminum compounds, and the technology and uses of the metal and its alloys. Kent R. Van Horn, A.S.M., director of the Research Laboratories, Aluminum Co. of America, has been appointed a member of the committee.

TO A.S.M. Members: Many of you are looking forward with pleasure to more details about the Technical Societies Congress in Europe from June 8-24, 1955. If you wish to be immediately informed on additional plans as they develop for the technical program and the planned visits, then send your name to A.S.M. headquarters and request to be placed on the mailing list to receive information about "A.S.M. to Europe in '55".

Developments in Naval Ordnance Traced by Speaker at Rocky Mt.

Speaker: Gilbert C. Hoover
Atomic Energy Commission

At a meeting of the Rocky Mountain Chapter's Denver Section, Rear Admiral Gilbert C. Hoover, field manager of the Rocky Flats Plant, Atomic Energy Commission, presented a talk entitled "Forty Years of Naval Ordnance". Adm. Hoover's talk was primarily concerned with development work on guns, armor and projectiles, and he cited personal experiences with ordnance gained in service in both world wars.

Adm. Hoover first discussed the evolution of fire control, starting with pointer fire, which consisted of direct sighting of each gun separately. Later the master-key, follow-the-pointer and director fire methods were developed, thus permitting an entire battery of guns to be sighted and fired from a centrally located and elevated master telescope. Radar has since played a great role in fire control, particularly in anti-aircraft gunnery. It has also proved to be immensely valuable as an enemy search instrument and navigational aid. He strongly stressed the importance of radar in World War II.

The Admiral gave as much information about recent developments of naval rocket-type projectiles as security regulations would allow.

The talk was concluded with a brief discussion on unclassified phases of the A.E.C. Program at Rocky Flats.

Included in the business meeting was a presentation of a 25-year member certificate to Adm. Hoover.—**Reported by Eugene Jiannetti for the Rocky Mountain Chapter.**

Fabricating Metal Powders Into Usable Forms Is Topic at Peoria Meeting

Speaker: A. S. Doty
P. R. Mallory & Co.

A. S. Doty, senior staff engineer, P. R. Mallory & Co., outlined the process of fabricating metal powders into usable forms in a talk entitled "Powder Metallurgy" which he gave recently before the Peoria Chapter.

Mr. Doty defined powder metallurgy as the art and science of manufacturing useful articles from metal powders and the science of making these powders.

Powder metallurgy is not new. Articles were made of metal powders as early as 3000 B.C. Modern powder metallurgy probably received its start from the work of the English chemist Wollaston, who fabricated platinum from powder at the beginning of the nineteenth century. This was followed approximately a century later by the preparation of tungsten and molybdenum.

Some prevalent present-day uses for powder metallurgy are the making of oilless bearings, electrical contacts and sintered carbides.

The steps involved in the powder metallurgy process are: The production of the powder, blending, pressing or compacting, sintering, and sometimes repressing or coining.

The powder may be made by atomization, condensation, thermal decomposition (carbonyl process), reduction of oxides, precipitation, and combinations of these processes. The characteristics of the finished powder are peculiar to the means by which it is produced.

Blending of the powder is sometimes very important to attain desired grain size distribution. Pressing must be closely controlled, and powder measurement must be accurate to obtain desired densities which are controlled by thickness or applied pressure. Care must be taken in handling pressed compacts as they are not tightly bonded until after the sintering operation.

Sintering is the subjecting of the pressed compacts to elevated temperatures for the purpose of bonding. The exact mechanism of the process is not known. Some atmospheres used in sintering are hydrogen, dissociated ammonia or city gas. Reducing atmospheres are more common and better suited, in most instances, than inert ones. Sintering temperatures may be as high as 3000° C. for refractory metals.

Repressing or coining is used to obtain much closer dimensional tolerances of the finished part.

Two distinct advantages of the use of powder metallurgy are: It may be cheaper, as machining may be eliminated, and it makes possible the fabrication of materials or products which connot otherwise be fabricated, such as oilless bearings, porous metal filters, cemented carbides, tungsten and molybdenum products and machinable high-density alloys.

After his talk, Mr. Doty showed a series of slides picturing the powder metallurgy process both schematically and with actual photographs.—**Reported by W. O. Kaarlela for the Peoria Chapter.**

Age Hardenable Alloys Subject at Texas

W. A. Mudge (Left), Spoke on "Age Hardenable Alloys" at a Meeting in Texas. He is shown with, from left: A. R. Oakley, Jr., Vice-Chairman; W. M. Crook, Chairman; and J. Rice, International Nickel Co. (Photo by L. Dolan)

Speaker: W. A. Mudge
International Nickel Co.

Since the discovery of the phenomenon of age hardening in the early part of the twentieth century, metallurgy has been supplied with an important new tool, according to W. A. Mudge, director of technical services, International Nickel Co., who spoke on "Commercial Age Hardenable Alloys" before the Texas Chapter during a recent meeting.

Work by the German, A. Wilm, on the addition of copper and magnesium to aluminum produced the first commercial alloy, duralumin. In duralumin, copper dissolves in aluminum in an unstable condition, and upon aging, precipitates, increasing hardness of the alloy greatly.

In industry, age hardening has proven highly valuable because metal may be fabricated in the soft condition and then hardened to higher levels. Also, age hardening and cold forming may be superimposed upon one another. Carbon content, while affecting the base hardness and the solubility of the hardening elements, is a part of the age hardening mechanism only in the iron-base alloys.

Commercial applications of age hardening in the past have been chiefly from the field of aluminum, which has been highly accepted in the aircraft industry because of the high strength imparted to this light metal.

Other age hardening alloys discussed included those of zinc, magnesium, copper, nickel, platinum metals and stainless steels.—**Reported by Jim Glaze for the Texas Chapter.**

Describes Experimental Reactors

C. D. Smith (Left), Chairman, Savannah River Chapter, and Frank Foote, Argonne National Laboratory, Are Shown at the Speaker's Table During the First Meeting of the Chapter. Dr. Foote spoke on "Experimental Reactors"

Speaker: Frank Foote

Argonne National Laboratory

The first technical meeting of the newly organized Savannah River Chapter featured a talk entitled "Experimental Reactors" by Frank Foote, director of the metallurgical division, Argonne National Laboratory.

Dr. Foote's talk was concerned principally with the economics of reactors, specifically the enriched breeder reactor now in operation at Arco, Idaho. Most of the reactors built to date, such as the Hanford and Savannah River machines, produce specific isotopes. They are wasteful in that vast quantities of energy which are available as a by-product of these operations are not utilized. At least two reactors have been constructed which make available the energy evolved from fission of U^{235}, the enriched breeder reactor and the submarine reactor.

The enriched breeder reactor was the first atomic pile designed and built to produce useful energy. A secondary consideration of its design was the possibility of converting nonfissionable isotopes such as thorium or U^{238} into a fissionable material which might then be used to power other reactors. The nuclear reactions involved are well known, thorium becoming U^{233} and U^{238} becoming plutonium when bombarded with neutrons. Both of these end products are fissionable and therefore useful as a source of power. When U^{235} fissions, an average of 2.5 neutrons is evolved. In order to maintain the chain reaction, one neutron must be utilized to cause fission of another U^{235} atom. This leaves 1.5 neutrons which are potentially available for production of other isotopes. In the enriched breeder reactor, it is hoped that less than 0.5 neutron will be wasted and therefore as much fissionable material produced as is used.

The submarine reactor was also designed to produce useful power. However, cost is a secondary consideration, inasmuch as this is a military machine which has certain other advantages, such as compactness. No attempt is being made to breed new fissionable material. The fact that it works at all, however, is a clear demonstration of the possibility of nuclear power plants.

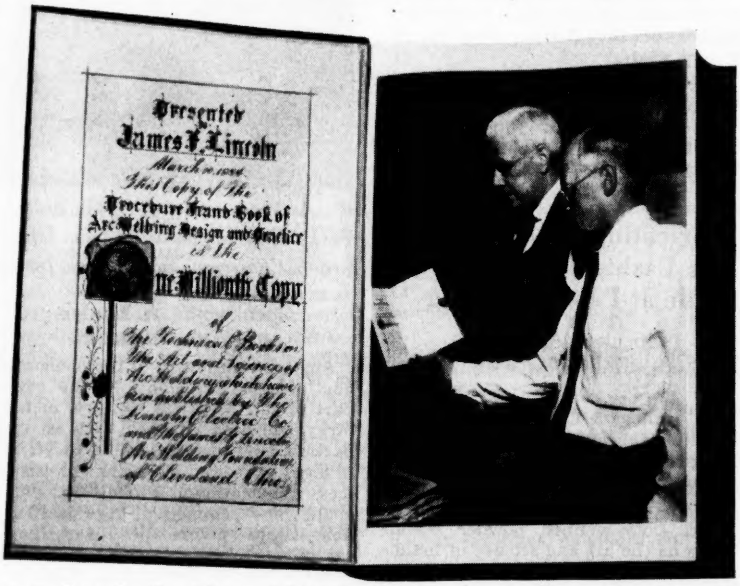
When uranium is bombarded in a reactor, certain changes in physical makeup occur which may affect the operation. This was illustrated by the speaker by a slide which showed a bar of uranium before and after irradiation. The exposed bar had changed appreciably, bearing little resemblance to its former condition. In another slide, it was demonstrated that a bar of uranium which was metallurgically treated retained most of its properties when irradiated.

Dr. Foote discussed the economics of coal versus nuclear power plants. His conclusions were that in this country, with its abundance of coal, nuclear power would cost about the same as conventional energy. However, in places such as Great Britain, where coal reserves are being depleted rapidly and costs are high, it would seem that nuclear power plants can compete economically.—**Reported by Charles D. Smith for the Savannah River Chapter.**

Revere Buys Plant

Revere Copper and Brass Inc. has announced the purchase of a plant in Lockport, Ill., for the production of Lockseam tube, rolled moldings and shapes, presently made in the company's Chicago manufacturing division. The new plant contains 52,500 sq. ft. of space. Machinery now at the Chicago plant will be moved to Lockport within 90 days.

Celebrates One Millionth Welding Book



J. F. Lincoln, President of Lincoln Electric Co., Is Shown Receiving an Illuminated and Inscribed Copy of the "Procedure Handbook of Arc-Welding Design and Practice" From A. F. Davis, Vice-President and Secretary of the Company. This copy of the Procedure Handbook is the one millionth copy of the technical books on arc welding published by the Lincoln Electric Co. and the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio

Speakers Discuss Continuous Casting Of Steels at Calumet

Speakers: Isaac Harter, Jr.
R. R. McClain
Babcock and Wilcox Co.

Isaac Harter, Jr., and R. R. McClain of the Babcock and Wilcox Co. discussed "Continuous Casting of Steel" at a meeting in Calumet.

Continuous casting was described as the process of continuously pouring molten metal into the top of a water-cooled vertical mold and withdrawing a solidified, or partially solidified, casting from the bottom. The purpose of this process is to simplify or eliminate some of the present costly steps in making steel products, achieve greater yields in the conversion of molten metal into finished product, and to reduce the capital and operating costs now required. The development of this process is a joint endeavor of the Republic Steel Corp. and the Tubular Products Division of Babcock & Wilcox Co.

A movie depicting the operations in the pilot plant located at Beaver Falls, Pa., was shown.

In operation, molten metal is delivered from the melt shop and held in a specially designed ladle which keeps the metal molten without altering its chemical composition or cleanliness. The metal is poured into a tun dish which serves as an effective slag catcher and metal guiding device. From the tun dish the metal is poured directly into the top of the mold. The mold, which in the pilot plant is constructed of a copper alloy about ¼ in. thick, is surrounded by a jacket through which water is circulated at high velocities to hasten solidification of the metal. Before pouring is started, a stool, supported from below, is positioned inside the mold and supports the metal in the early stage of casting. As metal is poured into the top of the mold the stool is lowered. A pair of pinch rolls support and lower the casting. Pouring speed is controlled by an X-ray set-up which regulates the level of molten metal in the mold. The casting is torch-cut to practical lengths without interrupting the progress of the operation.

Mr. Harter pointed out that before either of the companies participating in this development work erect a production plant it is their belief that the most commonly used grades of steel should be processed in both bar and slab shapes in the pilot plant. To date successful continuous castings in 7 x 7 in. form have been made of all common grades up to 1.10 carbon, low alloys, and such stainless as 302, 303, 304, 321, 410, 416 and 430. In a plant of conventional size the yield from such a process would be about 90% as compared to 75% for the hot-top ingot practice. It is hoped that a production plant to cast stainless steel will be started by the end of 1954.—**Reported by K. R. Hine for Calumet.**

Officers Honored By Oak Ridge Chapter

Oak Ridge Chapter's National President's Night Honored James B. Austin and Six Past Chairmen of the Chapter. Dr. Austin gave a talk on "Magnification in Time in Metallurgical Operations". Shown are, back row, from left: Robert Coyle, General Electric Co.; L. K. Jetter, Oak Ridge National Laboratory; and W. T. Carey, Ferrotherm Co. Front, from left, are: E. E. Stansbury, University of Tennessee; Dr. Austin; J. R. McGuffey, Carbide and Carbon Chemicals Co.; and E. C. Miller, Oak Ridge National Laboratory. (Reported by Alvaro H. Mejia for the Oak Ridge Chapter)

Defines Fractology At Meeting in York

Speaker: Carl A. Zapffe
Consulting Metallurgist

Carl Zapffe, consulting metallurgist, spoke on "Fractology" before a joint meeting of the York Chapters of the American Society for Metals and the American Welding Society.

Dr. Zapffe pointed out that fractology is a new term employed for the science and study of fracture, but that the field is not new. Ancient knowledge of fracture is evidenced by the remarkable workmanship of Stone Age tools and weapons made of flint, as well as the great pyramids, obelisks and aqueducts of early Metal Age civilizations.

Fractography, he further defined, is a special microscopic procedure which is of advantage because it permits observation of the true interior of the grain, unchanged by polishing and etching. Further, it allows studying the path of the failure itself rather than a random cross section. Information of a sort unattainable by normal microscopic technique is provided by fractography.

The study of fracture facets at high magnification (100 to several thousand) is dependent upon a specially devised fixture which permits orienting a given facet with the axis of the microscope. Once the facet is oriented, the lens is moved closer in order to observe it at high magnification.

The fracture of a metal holds much information for the metallurgist. Fractures are caused by fatigue, corrosion, brittleness, segregation and lamination—each has its own characteristics. Thereby arises the practical applications of fractography, such as deoxidation control in molybdenum production.—**Reported by John A. Gulya for York.**

Montreal Chapter Sets Up McGill Scholarship

The Montreal Chapter has established a scholarship at McGill University in memory of Gordon Sproule, a graduate of the University in 1908 and a member of the staff of the department of metallurgical engineering from 1918 to 1953, as a token of his ability and in appreciation of his many services to the Society.

The award, which consists of $200, is to be made by the faculty of engineering on the recommendation of the department of metallurgical engineering to a fourth year student of creditable academic standing, of engineering promise, who has need of financial assistance.

The scholarship has been established for one year but the Chapter hopes to be able to continue it on an annual basis.

Describes Methods Of Chemical Cleaning And Metal Finishing

Speaker: H. M. Goldman

Enthone, Inc.

Hubert Goldman, assistant to the sales manager, Enthone, Inc., spoke on "Chemical Cleaning and Metal Finishing" at a meeting of the Columbus Chapter. Frederick Fink of Battelle Memorial Institute acted as technical chairman for the evening and conducted a lively discussion period at the conclusion of Mr. Goldman's talk. That this important but rather unusual subject evoked a great deal of interest was amply demonstrated in the question and answer session.

Mr. Goldman discussed types of dirt to be removed and the cleansing action of various cleaning agents. He followed with a more detailed discussion on chemical cleaning for conversion coatings, for painting and electroplating. The dependence of the degree of cleanliness required on the type of coating to be applied was stressed. Mr. Goldman noted that many of the cleaning troubles arising in the production line could be blamed on process changes not made known to the plater.

As a rule, drawing compounds, lubricants, oils and fats, scale, lime, metal dust, grits, polishing compounds, etc., must be removed before finishing the product. To accomplish this, operations such as emulsification, dispersion, saponification, solvency, electrochemical or chemical cleaning are employed. They may be broadly classified as physical or chemical in action. Oxides are generally removed by acid treatment, but recent work on iron and steel has demonstrated the suitability of alkaline cleaners. To remove oxide scale from areas of limited access, an alkaline electrolytic periodic reverse-current treatment has been found useful. The periodic reversal of the current lessens the possibility of hydrogen embrittlement where this may be a deterrent to ordinary cathodic electrolytic cleaning. The general superiority of electrolytic cleaning is attributed to chemical action and the production of an active oxidizing or reducing gas at the work surface.

In preparing surfaces for chemical conversion coatings, Mr. Goldman recommended vapor degreasing followed by a mild alkaline cleaner, or a strong alkaline cleaner followed by a mild oxalic acid dip. In cleaning for painting, he pointed out that most paints are formulated to take care of some dirt, but that oils should be removed by alkaline cleaning and a mild acid cleaning, the best results being secured on a slightly acid or neutral surface. Electrolytic or bright dip pretreatment was advised for surface cleaning prior to electroplating. The biggest problem in surface cleaning today, Mr. Goldman stated, is the removal of carbon smut from the surfaces of iron or steel.—**Reported by John Stacy for the Columbus Chapter.**

Cites Role of Metallurgy In Atomic Energy Program

Speaker: Leonard A. Abrams

Atomic Energy Commission

The Notre Dame Chapter heard a talk on the "Role of Metallurgy in the Atomic Energy Program" by Leonard A. Abrams of the Atomic Energy Commission, Savannah River Project. In spite of the fact that very few of the members anticipate use of atomic materials in their own industrial work, their interest was manifested by the good attendance.

Mr. Abrams showed a film on the atomic tests in the Pacific and presented some of the problems confronting metallurgists working on the materials used for the construction of a reactor. He showed specimens of uranium and other materials and demonstrated their radioactivity with a Geiger counter.—**Reported by R. C. Pocock for Notre Dame.**

Dies as Result of Chemical Explosion

Lex Golden, chief of the chemical corrosion section at the Bureau of Mines, died recently as a result of an accident at the laboratory in College Park, Md. The incidents leading to the death of Mr. Golden are as follows:

On the afternoon of Dec. 29, 1953, an acid explosion occurred at the Bureau of Mines, metal corrosion laboratory. Involved in the explosion was a Walter L. Acherman, whose eyes and face were badly splashed with acid. The noise of the explosion directed the attention of several persons, including Mr. Golden, to the aid of the victim. He and the other two men began watering the victim's face and eyes and removed him from the deadly cloud of oxides of nitrogen which covered the area. When Mr. Golden saw that

the other two men were adequately caring for the victim, he went back into the fume-filled area, and, with others, opened windows to ventilate the area. He suffered severe damage to his lungs which resulted in his death on Jan. 25, 1954.

Mr. Golden was born in Warfordsburg, Pa. He graduated from the University of Maryland in 1936 with a B.S. in chemistry and in 1940 with a M.S. in chemistry. He worked in soils research at the University of Maryland from 1936 to 1942, when he joined the Bureau of Mines as analytical chemist. He became chief of the chemical corrosion section in 1948. He wrote many papers dealing with corrosion resistance of zirconium and titanium.

Mr. Golden was a member of the Washington Chapter A.S.M. He leaves his wife, Mary, and three children.

Worcester Hears Guided Missile Talk

Leaders at a Meeting Held Recently in Worcester Included, From Left: Joseph C. Danec, Norton Behr-Manning Overseas, Inc., Program Chairman; Herbert D. Berry, Thomas Smith Co., Technical Chairman; Walter R. Dornberger, Bell Aircraft Corp., Who Presented a Talk on "Guided Missiles"; Harold J. Elmendorf, American Steel & Wire Division of U. S. Steel Corp., Chapter Chairman. (Reported by C. Weston Russell for Worcester Chapter)

Chattanooga Hears Pipe Welding Talk

Present at a Meeting of the Chattanooga Chapter Were, From Left: L. N. Wall, Combustion Engineering, Inc., Secretary-Treasurer; Jack Stocker, Dixie Logging Tool Co., Vice-Chairman; A. D. Gordon, Republic Steel Corp.; J. H. Middleton, Republic Steel Corp., Who Talked on "Manufacture of Electric Welded Transmission Pipe"; and Ab Flowers, Chairman

Speaker: J. H. Middleton
Republic Steel Corp.

The Chattanooga Chapter heard a discussion of "The Manufacture of Electric Welded Transmission Pipe" by J. H. Middleton, chief metallurgist, Republic Steel Corp., Southern Division. Mr. Middleton was assisted in his talk and the discussion which followed by A. D. Gordon, assistant chief metallurgist, Republic Steel Corp.

Republic Steel has built a mill at Gadsden, Ala., to manufacture expanded steel pipe by the electric fusion submerged-arc welding process. The mill was built to make pipe with wall thickness from ¼ in. to ½ in. inclusive, and outside diameters of 20 in. to 30 in. inclusive. The pipe is used principally for the transportation of natural gas. The plates used are rolled in an adjacent mill.

The manufacturing process may be divided into three groups of operations which are basically the same for all wall thicknesses and diameters. These groups are plate preparation and forming, seam welding, and sizing and finishing.

In the first group of operations the plates are machined and sheared to predetermined sizes, depending on the size of pipe to be made. The plates are also edge-formed and rolled into cylinders which are then ready for welding into pipe.

The second group of operations is concerned mainly with the submerged-arc welding of the seam, both inside and outside. This welding is done by using twin arcs, one direct current and one alternating current, at speeds approximately 45 in. per min.

In the last group of operations, the pipe is sized, tested and finished on the ends for field welding. Both ends of each pipe are mechanically expanded to size, and the pipe is hydraulically expanded approximately 1½% within fixed diameter dies. The expanded pipe is tested with hydrostatic pressure while in the expanding machine to the minimum specified. After being inspected both inside and outside, the pipe is weighed and delivered to storage and shipping skids from which it is loaded on railroad cars or trucks.

The specifications require minimum physicals of 52,000 psi. yield strength, 65,000 psi. ultimate tensile and 22% elongation.

Slides illustrating points made by Mr. Middleton were projected by W. L. Dearing, Jr., Combustion Engineering, Inc.—**Reported by C. R. Pandelis for Chattanooga.**

Shows Need of Research To Keep Steelmaking Costs at a Minimum

Speaker: K. L. Fetters
Youngstown Sheet and Tube Co.

K. L. Fetters, assistant to the vice-president of operations, Youngstown Sheet and Tube Co., spoke on "Steelmaking, Production or Research" at a meeting of the Minnesota Chapter. He illustrated his talk with a few well-chosen slides showing the relationship of pertinent factors in steel production.

Raw material cost has risen and quality fallen as we have exploited our natural resources, Dr. Fetters said. Silica in ores has increased; sulphur and ash in coking coal have doubled; labor rates have multiplied and equipment costs gone up 2½ times in the past 15 years. However, research and mechanization have held the rise in steel price below the general cost rise.

Elimination of the increased sulphur in openhearth practice requires increasing the slag because the equilibrium ratio of the sulphur in the slag and in the bath is fixed. The heat required per ton increases in proportion to the thickness of the slag due to the insulation of the slag cover. The increased heat cost is in addition to the cost of the extra limestone.

Perhaps desulphurizing with soda ash in the ladle may soon have to be used in America as abroad, Dr. Fetters stated. Coal now has to be washed. Ores have to be beneficiated to remove the waste before smelting and sintered to reduce the fines that limit blast effectiveness. Electric furnaces will become economical in tonnage production as the sulphur in the oil for openhearth heating goes up. Direct casting will pay out more and more in the future. Glass lubricated extrusion may replace rolling mills in some instances. Hydrogen embrittlement must be increasingly controlled in high-temperature high alloys as for jet engines.

A favorable political cilmate is essential, said Dr. Fetters, if the steel industry is to keep up the race with growing natural limitations. Research can devise methods but practice requires large investment. A single blast furnace now costs nearly $25,000,000, and the Lake Superior taconite beneficiation plants are costing hundreds of millions, all of which must be paid for out of earnings.—**Reported by Knox A. Powell for the Minnesota Chapter.**

Films Shown at British Columbia Feature Carbides

Speaker: Charles Cumming
A. C. Wickman (Canada) Ltd.

Charles Cumming, of A. C. Wickman (Canada) Ltd., showed two of his company's films "Application of Carbides" and "Wickaloy at Work", during a meeting of the British Columbia Chapter.

Mr. Cumming pointed out that the biggest trouble with the use of the carbides was the lack of knowledge in the application of carbide tools, which are not being used to the best advantage. He distributed sets of Wickaloy pocket books which detailed the application of carbides and stressed that this type of information should be passed on to the man in the shop where it would do the most good.

The film "Application of Carbides" demonstrated the training of personnel from different factories in the use and application of carbide tools at the Wickman plant.

The film "Wickaloy at Work" showed tools in actual use at about 20 different plants in Great Britain. The application of the tools to actual jobs was shown, the speeds, feeds and depth of cuts demonstrated, and the many production advantages of the tools were illustrated.—**Reported by R. H. Fenton for the British Columbia Chapter.**

Students Hear Talk on Boron Hardenability in Steel at New York

Speaker: Joseph Spretnak
Ohio State University

At the Student's Night Meeting of the New York Chapter, Joseph Spretnak, Ohio State University, spoke on "Boron Hardenability in Steel". Prof. Spretnak outlined the history of boron's development as a substitute for less plentiful alloying elements such as nickel, chromium and manganese. The use of boron was prominent in World War II and in the Korean war. The recent decline of the role of boron was attributed to the availability of more common alloying elements. The present use and consideration of boron is a function of its potential in hardenability. In time of emergency, Prof. Spretnak pointed out that, according to John Mitchell's analysis, the feasibility of doubling present-day production of hardenable alloy steels would be dependent on the elements chromium and boron.

Prof. Spretnak then discussed the question, "What does boron do for us?" He pointed out that it enhances hardenability, it aids in the graphitization of malleable iron and it enhances creep resistance in austenitic-type high-temperature alloys.

Prof. Spretnak discussed the type of compounds formed by boron and indicated the possible use of boron as a scavenger with respect to nitrogen and carbon in iron. In this respect it might be expected that the affinity of boron for carbon would slow up the decomposition of austenite but theoretical analysis indicates that boron should act as if carbon were not present at all.

Prof. Spretnak pointed out that the mechanism of the boron hardenability effect is a highly controversial matter at present.

The recently determined $Fe-Fe_2B$ phase diagram was discussed. Because of the peritectoid reaction, it was predicted that boron should form an interstitial solid solution in gamma iron and a substitutional solid solution in alpha iron. Diffusion data by Cyril Wells and associates appear to corroborate this prediction. This feature may be of some importance in the hardenability effect. Data were presented to show that boron is "surface active" in iron (i.e., it is significantly adsorbed to the austenite grain boundaries).—**Reported by Edward Mullarkey for New York.**

Precision Castings Topic At Joint ASM-AFS Meeting

Speaker: H. W. Dietert
H. W. Dietert Co.

A joint meeting of the Saginaw Valley Chapters of A.S.M. and A.F.S. heard Harry W. Dietert, H. W. Dietert Co., speak on "Precision Castings".

Mr. Dietert pointed out that there is only one basic reason for specifying precision castings—to reduce costs by eliminating or reducing future operations on a casting. With the aid of slides, molds and castings, Mr. Dietert reviewed six casting methods: Lost wax; ceramic mold or plaster mold; shell mold or "C" process; Dietert or "D" process; machined graphite mold; and the high-pressure mold process.

The lost wax process utilizes wax or plastic patterns and refractory mold material. Its use is limited to small castings. The ceramic or plaster mold process uses metal patterns and can be used for a wide range of casting sizes and shapes. The shell mold process uses metal patterns and plastic-bonded refractory molds. The Dietert process uses oil or resin-bonded sand which is blown in the cavity between a hot metal dryer and a cold metal pattern. The machined graphite molds are being used to cast 1000-lb. steel castings. Synthetic graphite is used as a mold material and up to 125 castings can be made per mold before it requires reworking. In the high pressure molding process, a bentonite binder is used with squeeze pressures of 450 psi. and up, to produce sand molds with high hardness and true dimensions.—**Reported by Nicholas Sheptak for the Saginaw Valley Chapter.**

Students Attend Special Meeting in Cincinnati

Senior Metallurgical Students and Faculty of the Metallurgical Department of the University of Cincinnati Who Attended the Student Night Meeting of the Cincinnati Chapter Included, Seated: William Tholke, Professor; R. O. McDuffy; Fred Westerman, Professor; and William Licht, Head of the Chemical and Metallurgical Department at the University. O. W. McMullan, chief metallurgist, Bower Roller Bearing Co., presented a talk entitled "Fundamentals of Metallography in Shop Practice". (Reported by W. D. Whalen)

Gives Methods of Analyzing Tool Failures

J. Y. Riedel (Center), Toolsteel Engineer, Bethlehem Steel Co., Who Presented a Talk on "Tool Failures" at a Meeting in Jacksonville, Is Shown With H. J. Huester (Left), Chairman, and W. S. Morris, Vice-Chairman

Speaker: J. Y. Riedel
Bethlehem Steel Co.

J. Y. Riedel, toolsteel engineer, Bethlehem Steel Co., talked on "Tool Failures and Tool Trouble Shooting" at a meeting held in Jacksonville.

In describing and analyzing tool failures, Mr. Riedel pointed out that everyone who makes production tools is faced with the problem of making a tool which will be both hard enough to stand up under the anticipated service conditions and ductile enough not to crack, either in manufacture or in use. Since it is impossible to obtain maximum hardness and high ductility at the same time, some compromise is necessary on most tools. Once the proper balance has been determined during actual service, maintaining this balance should guarantee continued satisfactory performance.

Mr. Riedel listed good design, sound toolsteel of the proper grade, correct heat treatment, proper grinding and proper application of the tool as the most important factors contributing to successful toolmaking. These fundamentals were likened to the links of a chain, wherein a deficiency in any one of the elements or links leads to trouble. Slides were shown by the speaker to illustrate types of failures which had been gathered from actual practice.

Copies of a publication "The Toolsteel Trouble Shooter" were distributed to members after the meeting. **—Reported by Walter S. Morris for Jacksonville.**

Progress in Aluminum Development Discussed At Milwaukee Meeting

Speaker: John R. Willard
Aluminum Co. of America

"What's New in Aluminum" was the topic discussed by John R. Willard, manager, sales engineering and development division, Aluminum Co. of America, in Milwaukee.

Mr. Willard described aluminum as a comparatively new metal which has made great strides in the last 20 years—production has increased from 80 million pounds in 1933 to 2½ billion pounds in 1953. In discussing the aluminum fabricating field, he stated that new and larger forging and extruding presses and a new rolling mill for the production of tapered sheet have been developed. New aluminum alloys with high tensile strength and resistance to high temperatures are being developed. New welding techniques include shielded-arc welding, brazing and synthetic bonding.

Mr. Willard also described new finishes for aluminum, such as thicker and harder oxide coatings produced electrolytically, the electroplating of chromium and other metals on aluminum, making possible, for example, chromium cylinder walls in an aluminum engine block, and lower melting point frits which make enameling of aluminum possible. After discussing the commercial applications of aluminum in the building industry, transportation and electrical fields, Mr. Willard concluded his talk with a question and answer period.**—Reported by D. E. Wallschlaeger for Milwaukee.**

New England Chapters Meet in Providence

The New England Regional Meeting of the Hartford, Rhode Island, Worcester, New Haven, Boston and Springfield Chapters of the American Society for Metals was held in Providence, R. I., on May 14.

The program of this full-day meeting included plant visits to the Quonset Naval Air Station and the Metals and Controls Corp., General Plate Division. Technical sessions featured talks on "Hot Extrusion of Steels and Other Alloys", by Jerome Strauss, vice-president of Vanadium Corp. of America, and "Radioactive Isotopes in Metallurgy", by A. E. Focke, manager of materials development, Aircraft Nuclear Propulsion Division, General Electric Co.

The meeting closed with a banquet at which James H. Hinman, technical advisor, Revere Copper & Brass Inc., was toastmaster, and Fred L. Whipple, chairman, department of astronomy, Harvard University, gave a talk entitled "Shooting Stars".

Scholarship Awarded in Cincinnati

William Licht, Head of the Chemical and Metallurgical Department at the University of Cincinnati, Presents an A.S.M. Scholarship Award to Clifford Selby, Junior Metallurgical Engineering Student at the University, During a Recent Meeting in Cincinnati. (Reported by W. D. Whalen)

Talks on Atoms to Young Fellows

Hubert M. Alyea Is Shown (Right) Receiving the Congratulations of Norman F. Tisdale, Jr., Following the Presentation of His Talk on "Atomic Energy: Weapon for Peace" at the Young Fellows' Night Meeting in Pittsburgh

Speaker: H. M. Alyea

Princeton University

At the Pittsburgh Chapter's Young Fellows' Night, Hubert M. Alyea spoke on "Atomic Energy: Weapon for Peace". Dr. Alyea is professor of chemistry at Princeton University.

Dr. Alyea used many chemical reaction props, slides and blackboards for his enlightening talk. Four hundred and twenty members enjoyed a fine chicken dinner, and this group was supplemented by about 80 latecomers who heard the 2-hr. talk by Dr. Alyea. Careful attention of the audience was evidenced by the fact that no one left during the entire program, and the talk was followed by a standing ovation for the excellent presentation.

Dr. Alyea outlined the major steps in research and discovery that led ultimately to sufficient knowledge of atomic structure to permit man to tap nuclear energy. The military applications of nuclear reactions and fission were described, along with some of the devastating potentialities of A-bombs and H-bombs.

The talk closed with a brief summary of some of the peaceful uses of atomic energy, and an exhortation to all scientifically trained people to foster every possible means of impressing the public generally with the absolute necessity for establishing international control of atomic weapons.—**Reported by H. E. McGannon for Pittsburgh.**

SPEAKERS AVAILABLE

F. W. Witzke and C. T. Thompson, sales engineers with the Brush Electronics Co., have informed National Headquarters that one or the other of them would be available to all chapters of A.S.M. to present a talk entitled "How Surface Finish Control Can Reduce Machining Costs, Increase Production Capacity and Improve Your Product". The talk is illustrated with 35-mm. slides and takes about 50 to 60 minutes to deliver. The speakers, who will pay their own expenses to chapters requesting their talk, will cover surface roughness, why it is important to control and what the proper specification and control can mean in terms of reduced cost and improved products. They can be contacted through Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.

Toledo Presents Seminar On Machining Operations

The Toledo Chapter presented an advanced seminar on "Machining Operations" in cooperation with the University of Toledo on April 20, 1954. This one-day meeting included the following lectures and speakers:

New Developments in Machine Tools, by H. L. Tigges, executive vice-president, Baker Brothers, Inc.; Types and Applications of Cutting Tools, by R. E. McKee, associate professor of production engineering, University of Michigan; The Theory and Use of Cutting and Grinding Fluids, by A. B. Albrecht, research metallurgist, Monarch Machine Tool Co.; and Metallurgical Factors in Machinability, by L. J. Sheehan, chief metallurgist, Jones & Lamson Machine Co.

A general audience participation discussion of the various lectures closed the meeting.

Outlines Factors Important To Metal Cutting Methods

Speaker: Milton Shaw

Massachusetts Institute of Technology

The guest speaker at a recent meeting of the Penn State Chapter, Milton Shaw, Massachusetts Institute of Technology, approached his subject "Metal Cutting" in a qualitative manner, stressing the importance of realizing that the cutting action is a shearing one.

Dr. Shaw presented a 16-mm. movie which illustrated the actual effect of cutting tools on various workpieces. The huge amount of deformation of the grains in front of the tool before shearing, as well as the development of the shearing plane, were clearly evident.

Dr. Shaw went on to discuss laboratory experiments conducted on metal cutting, such as the measurement of forces involved in cutting. Of the four forces concerned, he said that only two were important—the frictional force and the shearing force. The method of measurement of temperature at the tool point was also explained. Temperature is an important factor in tool life.

One of the principal causes of tool wear is welding of the chips to the cutting point. During the process of cutting, these break away, carrying away particles of the tool and causing cratering on the face of the tool. To lessen this cratering wear, the work should be operated at higher speeds. When this is not practicable, lubricants which penetrate and react quickly with the metal to form a product more easily sheared may be employed instead.

Various techniques in measuring tool life were then explained. Among these were a radioactive method, a diamond-indenter method, the use of a tool until failure and measuring the flat following use, by far the most common method.

In industry there are three main interests—finish of the workpiece, its dimensional accuracy and life of the tool. These, however, are so related that compromises must be made among them to attain the desired result.

Dr. Shaw also spoke of problems in production such as the rate of feed of workpieces and the shape and wear of tools.—**Reported by W. Barry Collins for the Penn State Chapter.**

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

Stewart J. Stockett, Technical Abstracter

Assisted by Fred Body, Mitchell Baker, Mildred Landon and Members of the Translation Group

A General Metallurgical

114-A. Ultrasonic Flue Dust Elimination. H. Manley. *Engineer,* v. 197, Feb. 19, 1954, p. 291.

Use of siren to get high intensity and power levels for particle elimination. Photograph, diagram, graph. 10 ref. (A8)

115-A. Scrap Handling Speeded With Automatic Shear-Baler. W. G. Patton. *Iron Age,* v. 173, Mar. 18, 1954, p. 143-145.

Equipment and performance characteristics. Photographs. (A8, A5)

116-A. Metallurgical Education in the United States. Alfred Bornemann. *Metal Progress,* v. 65, Mar. 1954, p. 97-100.

Analysis of educational facilities and processes through which technically trained personnel are prepared. Tables, photograph. (A3)

117-A. Recovery of Metal Alloys. *Railway Gazette,* v. 100, Feb. 19, 1954, p. 213.

Rotary furnace incorporating a bottle-shaped crucible for melting swarf. Photograph. (A8)

118-A. Treatment of Complex Metal-Finishing Wastes. K. S. Watson. *Sewage and Industrial Wastes,* v. 26, Feb. 1954, p. 182-194; disc., p. 194-196.

Collection system, treatment plant and cost of constructing and operating these facilities. Photographs, tables, diagram. (A8)

119-A. Chromic Acid Recovery by Ion Exchange. R. J. Brink. *Sewage and Industrial Wastes,* v. 26, Feb. 1954, p. 197-202.

Equipment and operating procedures of installation for removing chromic acid from anodizing rinse water. Photograph, tables, diagrams. (A8, L19)

120-A. (German.) **Examples of New Developments in Metallurgy on the Basis of Chemical Research.** H. Schackmann. *Chemie-Ingenieure-Technik,* v. 26, no. 2, Feb. 1954, p. 65-72.

Influence of pure chemistry upon metallurgy explained on basis of numerous examples. Graphs, diagrams, photographs, table. 16 ref. (A general)

121-A. (German.) **Deposits of Coal, Iron, Petroleum and Uranium in the World.** Werner Hagen. *Glückauf,* v. 90, nos. 1-2, Jan. 2, 1954, p. 1-31.

Reivew of output in various countries. Tables, map. 37 ref. (A4, B10, Fe, U, Au)

122-A. Engineered Scrap Service Cuts Costs, Raises Profits. Julian Grombacher. *Iron Age,* v. 173, Mar. 4, 1954, p. 166-168.

Faster handling and better segregation of scrap gives industrial plants maximum price per scrap unit. Photographs. (A8)

123-A. Disposal of Cyanide Wastes From Plating Operations. Barnett F. Dodge, Charles A. Walker and Walter Zabban. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529, p. 113-119; disc., p. 119-120.

Eight methods investigated. Graphs. 8 ref. (A8, L17)

124-A. Primary Aluminum Output in 1954 Estimated at 1,400,000 Tons, Eight Times More Than in 1939. Martin L. Tressel. *Metals (Daily Metal Reporter Monthly Supplement),* v. 24, Mar. 1954, p. 9-11.

Supply sufficient to satisfy growing civilian requirements; price of metal compared with steel now much more favorable. Diagrams, charts. (A4, Al)

125-A. A Dictionary of Metallurgy. A. D. Merriman and J. S. Bowden. *Metal Treatment and Drop Forging,* v. 21, Mar. 1954, p. 115-122.

From "liquation" to "magnet". Tables, graph, diagrams, photograph. (To be continued.) (A10)

126-A. Disposal of Steel Production Wastes at the Fairless Works. G. A. Howell. *Sewage and Industrial Wastes,* v. 26, Mar. 1954, p. 286-297; disc., p. 297-299.

Waste waters containing mill scale, acids, flue dust and concentrations of oils and greases are treated close to their sources. Photographs, diagrams. (A8)

127-A. Resources-Research-Rewards. D. D. Morris. *Western Miner and Oil Review,* v. 27, Mar. 1954, p. 40-44.

Effects of research on mining and metallurgical industries. Economic results of development of new processes in mining and extraction of lead, iron and zinc. Charts. (A9, A4, B general, Fe, Pb, Zn)

128-A. (Pamphlet.) **Abstracting and Indexing Sources for Literature on Metals and Metal Fabrication.** Ellis Mount. Bibliography no. 2, 24 p. 1953. John Crerar Library, 86 East Randolph St., Chicago 1, Ill.

Selective list of 45 current indexing and abstracting services. 3 ref. (A10)

129-A. (Book.) **Iron and Steel Industries of the South.** H. H. Chapman. 427 p. 1953. University of Alabama, Birmingham, Ala. $7.50.

Natural resources; location of mines and plants; coal mining and preparation; raw material costs and wages; markets; economic characteristics; trends and potentials. (A4, B general, Fe, ST)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

130-A. (Book.) **Materials and Processes.** James F. Young. 2nd Ed. 1074 p. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $8.50.

Engineering fundamentals of materials and processes as they apply to design, production, and control of products. Metallic and nonmetallic materials in manufacturing processes. (A general)

131-A. (Book.) **Tin, 1951-1953. Review of World Tin Industry.** 100 p. 1953. International Tin Study Group, The Hague, Holland. $1.00.

International position in tin; world production, consumption, smelters, trade, stocks, and prices; and use of tin and tin plate. (A4, Sn)

B Raw Materials and Ore Preparation

129-B. The Production of Coke to Blast Furnace Specifications. James A. Beatty. *Blast Furnace and Steel Plant,* v. 42, Mar. 1954, p. 339-344.

Equipment, raw materials plant layout and processing techniques. Photographs, tables, diagrams. (B22, D1)

130-B. Modern Plant Will Treat Mesabi Lean Ores. E. C. Herkenhoff. *Engineering and Mining Journal,* v. 155, Mar. 1954, p. 78-83.

Equipment, plant layout and operating procedures. Diagrams, table, photographs. (B general, Fe)

131-B. Preparation of Ores. II. J. M. McLeod. *Iron & Steel,* v. 27, Mar. 1954, p. 103-109.

Sintering of low-grade iron ores. 55 ref. (B16, Fe)

132-B. Magnetizing Roasting of Low-Grade Iron Ores. H. Hendrickx and G. Scheibe. *Henry Brutcher, Altadena, Calif., Translation no.* 3212, 14 p. (From *Archiv für das Eisenhüttenwesen,* v. 23, nos. 9-10, 1952, p. 321-324.)

Previously abstracted from original. See item 360-B, 1952. (B14, Fe)

133-B. (English.) **On the Theory and Use of the Hydrocyclone.** G. Tarjan. *Acta Technica Academiae Scientiarum Hungaricae,* v. 7, nos. 3-4, 1953, p. 389-411.

Theory of operation and advantages in coal dressing and ore beneficiation. Tables, graphs. 11 ref. (B14)

134-B. (French.) **Preparation of the Burdon of Blast Furnaces Using Lorraine Minettes.** Paul Thierry. *Métallurgie et la construction mécanique,* v. 86, no. 2, Feb. 1954, p. 87, 89, 91.

Mixing, damping, coking, cooling and screening. Graph, diagram. (B13, D1, Fe)

135-B. (German.) **Sampling of Ores and Slags During Iron Manufacture.** Kurt Möhl. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 33-37; disc., p. 37-38.

Quantity of sample and place to secure it. Diagrams. (B11, Fe)

136-B. (Russian.) **New Discovery of Ilvaite in Copper-Nickel Sulfide Ores.** G. I. Gorbunov and N. A. Kornilov. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 323-325 + 1 plate.

Optical properties, X-ray analysis and interrelationship with sulfides and other material. Table, micrograph. 2 ref. (B14)

137-B. (Swedish.) **The Application of Hydraulic Cyclones in Low Grade Ore Milling.** P. H. Fahlström. *Jernkontorets Annaler,* v. 138, no. 1, 1954, p. 1-16.

Theory and action of hydraulic cyclone as a classifier with experiments on specular hematite slime. Application on various ores. Diagrams, graphs, tables, photographs. 21 ref. (B13, Fe)

138-B. Upgrading Manganese Ores. Three Kids Mine, Nevada. S. J. McCarroll. *Mining Engineering,* v. 6; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 199, Mar. 1954, p. 289-293.

Equipment, plant layout and processes. Photographs, tables, diagram. 6 ref. (B general, Mn)

139-B. Rare Earths Moving Fast. William E. Knapp and Wilbur T. Bolkcom. *Steel,* v. 134, Mar. 15, 1954, p. 104, 106.

Valuable properties result from addition of small quantities of rare earths to conventional alloys. Graphs, table. (B22, EG-g)

140-B. Concentration of Oxide Manganese Ores From Northeastern Nevada (Caviglia-Vietti, Berning, and Reed-Parker Deposits). G. M. Potter and R. R. Wells. *U. S. Bureau of Mines, Report of Investigations* 5023, Feb. 1954, 13 p.

Laboratory tests determine amenability to methods of concentration. Tables. (B14, Mn)

141-B. Beneficiation of Oxide Manganese and Manganese-Silver Ores From Southern Arizona. R. Havens, S. J. Hussey, J. A. McAllister and K. C. Dean. *U. S. Bureau of Mines, Report of Investigations* 5024, Feb. 1954, 30 p.

Studies to determine amenability to concentration. Tables. (B14, Mn, Ag)

142-B. Agglomeration and Beneficiation. *American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 12, 1953, p. 1-103.

Includes "Beneficiation of East Texas Iron Ores", W. R. Bond; "Quality Control of Blast Furnace Flue-Dust Sinter", E. C. Rudolphy and D. J. Carney; "Reduction-Oxidation Process for the Treatment of Taconites", F. M. Stephens, Jr., Benny Langston and A. C. Richardson; and "Sintering Fans—Construction and Application", H. R. Phelps. (B14, B15, B16, Fe)

143-B. Tin Production and Resources. F. Stuart Miller. Paper from "Symposium on Tin". ASTM Special Technical Publication no. 141. p. 3-24, 1952.

Nature and distribution of ores, mining methods, production statistics. Tables. 15 ref. (B general, Sn)

144-B. (German.) **Metallurgical Behavior of Chromium Ores.** Dieter Hoenes and Georg Volkert. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 1-10.

Production of ferrochrome from various ores. Structure and refining behavior of the ores. Tables, graphs, micrographs. 7 ref. (B22, Fe, Cr)

145-B. (Italian.) **Refractory Products in Metallurgy.** Francesco Savioli. *Metallurgia italiana,* v. 46, no. 1, Jan. 1954, p. 7-14; disc., p. 14.

Summarizes 21 reports delivered at 1953 International Research Meeting organized by Belgian Association for Promotion of Research in Glass and Siliceous Compounds in Brussels. Diagrams, tables, photographs, graphs, micrograph. (B19)

C

Nonferrous Extraction and Refining

85-C. Zinc by Distillation. *Canadian Metals,* v. 17, Mar. 1954, p. 16, 18.

Method of refining zinc, including equipment and techniques. Photographs. (C22, Zn)

86-C. Metals of the Future. G. J. Crites. *Instrumentation,* v. 7, no. 2, 1954, p. 14-15.

Vacuum furnaces plus accurate measurement and control of variables make possible production and processing of new metals such as zirconium, titanium, vanadium, cerium and germanium. Photographs, diagrams. (C25, Zr, Ti, V, Ce, Ge)

87-C. Chemically Pure Metals. *Instrumentation,* v. 7, no. 2, 1954, p. 34-35, 37.

Metals such as lithium, magnesium and antimony of high purity can be produced by distillation under high vacuum. Amount of pressure employed during distillation has important effect on purity. Photograph, diagrams. (C22, Li, Mg, Sb)

88-C. Copper Smelting in Boliden's Rönnskär Works Described. Olov Herneryd, Olof A. Sundstrom and Allan Norro. *Journal of Metals,* v. 6, Mar. 1954, p. 330-337.

Equipment, procedures and economics in single shift operation. Tables, photographs, diagrams. (C21, Cu)

89-C. Current Refractory Practice as Applied in Copper Smelting. William F. Rochow and Lincoln A. McGill. *Journal of Metals,* v. 6, Mar. 1954, p. 338-342.

Although refractories are available which permit reasonable or satisfactory smelting costs, extensive research continues in an effort to develop refractories which will be capable of withstanding even more severe treatment. Graph, diagram. 2 ref. (C21, Cu)

90-C. Copper Converting Practice at American Smelting and Refining Company Plants. F. W. Archibald. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 358-360.

Standardization of copper converting practice to attain a maximum unit blister production with a minimum of refractory consumption by careful location of tuyeres and by applying magnetite coatings on hard-burned magnesite brick linings. (C21, Cu)

91-C. (French.) **Application of Zone Melting Technique to Obtain High-Purity Aluminum.** Frédéric Montariol, Robert Reich, Philippe Albert and Georges Chaudron. *Comptes rendus,* v. 238, no. 7, Feb. 1954, p. 815-817.

Adaptation of method used to refine germanium. Reports attainment of purity of 99.998%. Tables. 3 ref. (C21, Al)

92-C. (German.) **Thermodynamics of Zinc Condensation.** Gotthard Björling. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 7, no. 2, Feb. 1954, p. 69-73.

Conditions necessary for zinc oxide reduction and condensation of generated zinc vapor in a form adaptable to practice. Graphs. 6 ref. (C22, P12, Zn)

93-C. (Hungarian.) **Complex Utilization of Bauxite.** Adam Juhasz. *Kohaszati Lapok,* v. 9, no. 1, Jan. 1954, p. 10-17.

Reduceability of iron oxide in bauxite, correct composition of the slags, waste gases and behavior of secondary constituents. Tables, graphs. 7 ref. (C21, Al)

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Relationship between economical current density and construction of furnaces. Methods for calculating necessary current densities and interpretation of results. Graphs, tables. 2 ref. (C23, Al)

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Control instruments and their operation in a continuous casting process of the Properzi type for production of aluminum rod. Photographs, diagrams. (C5, S18, Al)

96-C. Electrodeposition Research at the Bureau of Mines. Oliver C. Ralston. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529, p. 37-39; disc., p. 39-40. 1953.

Extractive metallurgy utilizes electrodeposition of metals as a recovery process. Electrophoretic deposition is used as means of recovering colloidal sizes of solids from aqueous suspensions of washed minerals. 4 ref. (C23)

97-C. Manganese Production by Electrolysis. *Chemical & Process Engineering,* v. 35, Mar. 1954, p. 89-90.

Electrolytic process for obtaining manganese from its ores is likely to prove economical and give a product free from impurities. Electrolytic manganese was successfully used in production of nonferrous manganese alloys and in steel production. Diagram. (C23, Mn)

98-C. Inside Three Atomic Factories. *Chemical Engineering,* v. 61, Apr. 1954, p. 130, 132, 134, 136.

Britain's atomic energy program. Uranium, plutonium production. Photographs. (C general, U, Pu)

99-C. Magnesium Extraction From Fused Salts. A. L. Hock. *Magnesium Review and Abstracts,* v. 9, Dec. 1953, p. 1-30.

Historical background, electrolysis in fluoride baths, electrolytes in molten chloride baths, principles of magnesium electrolysis, cells based on natural and artificial carnallites and on magnesium chloride cell feed, magnesium cells with liquid cathodes and possible trends in future design and operation of molten chloride cells. Diagrams, tables. 27 ref. (C23, Mg)

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Ferrous Reduction and Refining

136-D. Experiences in Salamander Tapping. C. M. Squarcy and E. H. Bare. *Blast Furnace and Steel Plant,* v. 42, Mar. 1954, p. 331-335.

Economy of time and money with incorporation of improved techniques. Photographs, diagrams, graph. (D9)

137-D. Flame Lengths. J. A. Leys. *Iron & Steel,* v. 27, Mar. 1954, p. 93-94.

Simple equations for calculating length of flames of fuel oil and coke oven gas in openhearth furnace. Case of combined flames of two fuels and equation for flame length given in general form. Graph. 5 ref. (D2)

138-D. Distribution of Manganese Between Slag and Metal Under Reducing Conditions. J. E. Stukel and J. Cocubinsky. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 353-356.

Investigation of equilibrium distribution of manganese between blast furnace type slags and iron saturated with carbon. Diagram, graphs, table. 5 ref. (D1, Mn, Fe)

139-D. Magnetite Pelletizing and the Production of Sponge Iron. *Mining Magazine,* v. 90, Feb. 1954, p. 75-78.

Brief account of ore dressing at Bodäs mines and sponge iron production at Sandviken, Sweden. Photographs, diagram. (D8, B16, Fe)

140-D. On the Possibility of Removing Copper From Steel and Pig Iron. L. Améen and C. Pfeiffer. *Henry Brutcher, Altadena, Calif., Translation no.* 3206, 26 p. (From *Jernkontorets Annaler,* v. 137, no. 7, 1953, p. 238-251.)

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Description and operation. Diagrams, photographs, charts. (D2, S16)

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Facilities and raw material sources. Photographs. (D general, B10, CI, ST)

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Radial distribution, influence of height of materials in the stack and various bell operations. Diagrams, graphs. (D1, Fe)

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Various aspects of charging. (D1)

146-D. (German.) **Low-Shaft Blast Furnaces.** E. Cotel. *Acta Technica Academiae Scientiarum Hungaricae,* v. 7, nos. 3-4, 1953, p. 413-423.

Present trends in construction. Probable evolution of small furnaces due to use of coke from low-grade coal. Diagrams. 21 ref. (D1)

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Reviews existing data on type of refractory materials, extent of improvements on the furnace and technology of its construction. Some Hungarian methods. Graphs, diagram. 11 ref. (D2)

148-D. Cost Comparisons of the Open Hearth and Electric Furnace. David D. Moore. *Iron and Steel Engineer,* v. 31, Mar. 1954, p. 55-65; disc., p. 65-69.

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149-D. Modern Arc Furnace Equipment and Practices. E. H. Browning. *Iron and Steel Engineer,* v. 31, Mar. 1954, p. 70-74; disc., p. 75.

Trends in use of electrical equipment, costs, effect of higher secondary voltages, transformers, circuit breakers and regulators. Graphs, photographs. (D5)

150-D. Bricklaying as a Factor in the Performance of Blast Furnace Linings. W. S. Debenham. *Iron and Steel Engineer,* v. 31, Mar. 1954, p. 76-79; disc., p. 79.

Brick quality and shapes, alignment of lining, packing between stacking and shell, bosh and stack cooler arches and bricklaying. Table, diagrams, chart. (D1)

151-D. Continuous Casting of Iron Bar. *Machinery (London),* v. 84, Mar. 5, 1954, p. 506-507, 516.

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Includes "Preheating and Blowing-In Practice at the Blast Furnace", R. J. Wilson; "Method of Blowing-In Blast Furnace From Bank", Walter W. Durfee; "Blowing-In Practice at American Steel and Wire Division, Duluth Works", W. A. Abbett, Jr.; and "Blast Furnace Blowing-In and Drying-Out Practices, Bethlehem Plants", H. M. Kraner. (D1)

154-D. Blast Furnace Operation. *American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 12, 1953, p. 246-325.

Includes "Some British Aspects of High-Top-Pressure Operation", R. P. Towndrow and W. Banks; "Distribution of Materials in a Blast Furnace Model", R. L. Stephenson and F. C. Langenberg; "Optimum Composition of Blast Furnace Slag as Deduced From Liquidus Data for the Quaternary System CaO-MgO-Al_2O_3-SiO_2", E. F. Osborn, R. C. DeVries, K. H. Gee and H. M. Kraner; and "Instrumentation for Blast Furnace Research", D. I. Sinizer, J. DePiccolellis and E. R. Poor. (D1)

155-D. (French.) **Induction Stirring in the Electric Arc Furnace Bath.** *Journal du Four Electrique,* v. 63, no. 1, Jan.-Feb. 1954, p. 13-17.

Advantages for steel-producing furnaces. Installations in Sweden and the Timken inductive stirrers in Canton, Ohio. Compares results. Tables, photographs, diagrams. (To be continued.) (D5, ST)

156-D. (German.) **Contribution to Deoxidation Control in Steel.** Walter Koch and Franz Wever. *Stahl und Eisen,* v. 74, no. 5, Feb. 25, 1954, p. 264-271 + 4 plates.

Shows that oxide inclusions cannot be completely avoided. Their nature may be influenced in steel works by simple measures. Graphs, micrographs, photographs, diagram. 6 ref. (D general, ST)

157-D. (German.) **Experiences With Gas Generators With Steam Jackets for Openhearth Furnaces.** Heinz Wübbenhorst. *Stahl und Eisen,* v. 74, no. 5, Feb. 25, 1954, p. 272-279.

Experiments and results. Tables, diagrams, graphs. 8 ref. (D2)

158-D. The Basic Open Hearth Process. I. Some Theoretical Considerations. G. Reginald Bashforth. *British Steelmaker,* v. 20, Mar. 1954, p. 88-93.

Chemical reactions involved in deoxygenizing process and problems of sulfur removal. Graphs. 15 ref. (D2)

159-D. Measuring Dust in Blast Furnace Gas. *British Steelmaker,* v. 20, Mar. 1954, p. 114.

Equipment enables alarm to be sounded if a predetermined dust level is exceeded. Provides continuous record of dust concentration and its variations. Photographs. (D1, A5)

160-D. Electric Furnace Cuts Costs. R. O. Loomis. *Electrical World,* v. 141, Apr. 5, 1954, p. 152.

Greater availability for charging; speed in making steel; refractory material costs only one-third that of openhearth; higher quality steel. Photograph, diagram. (D5, ST)

161-D. Oxygen Performs Dual Function in Direct Reduction Process. *Steel,* v. 134, Apr. 5, 1954, p. 120.

Method devised for Venezuela producers of iron ore is applicable to fine ores in this country, especially where a supply of coke oven gas is available. Diagram. (D8)

162-D. (Polish.) **Corrosion of Magnesite Refractories in Openhearth Furnaces.** Franciszek Nadachowski. *Hutnik,* v. 21, no. 1, 1954, p. 6-12.

Corrosion mechanism and effect of iron, oxygen and silicon. Table, micrograph, graphs. 8 ref. (D2, Fe)

163-D. (Book.) **American Institute of Mining and Metallurgical Engineers, Proceedings,** v. 12, 1953. 335 p. American Institute of Mining and Metallurgical Engineers, Inc., 29 W. 39th St., New York 18, N. Y. $10.00.

Proceedings of Conference of the Blast Furnace, Coke Oven, and Raw Materials Committee, held in Buffalo, N. Y., Apr. 1953. Agglomeration and beneficiation of iron ores; coal carbonization; blast furnace operation and blowing-in practice.

134-B. (French.) **Preparation of the Burdon of Blast Furnaces Using Lorraine Minettes.** Paul Thierry. *Métallurgie et la construction mécanique,* v. 86, no. 2, Feb. 1954, p. 87, 89, 91.

Mixing, damping, coking, cooling and screening. Graph, diagram. (B13, D1, Fe)

135-B. (German.) **Sampling of Ores and Slags During Iron Manufacture.** Kurt Möhl. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 33-37; disc., p. 37-38.

Quantity of sample and place to secure it. Diagrams. (B11, Fe)

136-B. (Russian.) **New Discovery of Ilvaite in Copper-Nickel Sulfide Ores.** G. I. Gorbunov and N. A. Kornilov. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 323-325 + 1 plate.

Optical properties, X-ray analysis and interrelationship with sulfides and other material. Table, micrograph. 2 ref. (B14)

137-B. (Swedish.) **The Application of Hydraulic Cyclones in Low Grade Ore Milling.** P. H. Fahlström. *Jernkontorets Annaler,* v. 138, no. 1, 1954, p. 1-16.

Theory and action of hydraulic cyclone as a classifier with experiments on specular hematite slime. Application on various ores. Diagrams, graphs, tables, photographs. 21 ref. (B13, Fe)

138-B. Upgrading Manganese Ores. Three Kids Mine, Nevada. S. J. McCarroll. *Mining Engineering,* v. 6; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 199, Mar. 1954, p. 289-293.

Equipment, plant layout and processes. Photographs, tables, diagram. 6 ref. (B general, Mn)

139-B. Rare Earths Moving Fast. William E. Knapp and Wilbur T. Bolkcom. *Steel,* v. 134, Mar. 15, 1954, p. 104, 106.

Valuable properties result from addition of small quantities of rare earths to conventional alloys. Graphs, table. (B22, EG-g)

140-B. Concentration of Oxide Manganese Ores From Northeastern Nevada (Caviglia-Vietti, Berning, and Reed-Parker Deposits). G. M. Potter and R. R. Wells. *U. S. Bureau of Mines, Report of Investigations* 5023, Feb. 1954, 13 p.

Laboratory tests determine amenability to methods of concentration. Tables. (B14, Mn)

141-B. Beneficiation of Oxide Manganese and Manganese-Silver Ores From Southern Arizona. R. Havens, S. J. Hussey, J. A. McAllister and K. C. Dean. *U. S. Bureau of Mines, Report of Investigations* 5024, Feb. 1954, 30 p.

Studies to determine amenability to concentration. Tables. (B14, Mn, Ag)

142-B. Agglomeration and Beneficiation. *American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 12, 1953, p. 1-103.

Includes "Beneficiation of East Texas Iron Ores", W. R. Bond; "Quality Control of Blast Furnace Flue-Dust Sinter", E. C. Rudolphy and D. J. Carney; "Reduction-Oxidation Process for the Treatment of Taconites", F. M. Stephens, Jr., Benny Langston and A. C. Richardson; and "Sintering Fans—Construction and Application", H. R. Phelps. (B14, B15, B16, Fe)

143-B. Tin Production and Resources. F. Stuart Miller. Paper from "Symposium on Tin". ASTM Special Technical Publication no. 141. p. 3-24, 1952.

Nature and distribution of ores, mining methods, production statistics. Tables. 15 ref. (B general, Sn)

144-B. (German.) **Metallurgical Behavior of Chromium Ores.** Dieter Hoenes and Georg Volkert. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 1-10.

Production of ferrochrome from various ores. Structure and refining behavior of the ores. Tables, graphs, micrographs. 7 ref. (B22, Fe, Cr)

145-B. (Italian.) **Refractory Products in Metallurgy.** Francesco Savioli. *Metallurgia italiana,* v. 46, no. 1, Jan. 1954, p. 7-14; disc., p. 14.

Summarizes 21 reports delivered at 1953 International Research Meeting organized by Belgian Association for Promotion of Research in Glass and Siliceous Compounds in Brussels. Diagrams, tables, photographs, graphs, micrograph. (B19)

C

Nonferrous Extraction and Refining

85-C. Zinc by Distillation. *Canadian Metals,* v. 17, Mar. 1954, p. 16, 18.

Method of refining zinc, including equipment and techniques. Photographs. (C22, Zn)

86-C. Metals of the Future. G. J. Crites. *Instrumentation,* v. 7, no. 2, 1954, p. 14-15.

Vacuum furnaces plus accurate measurement and control of variables make possible production and processing of new metals such as zirconium, titanium, vanadium, cerium and germanium. Photographs, diagrams. (C25, Zr, Ti, V, Ce, Ge)

87-C. Chemically Pure Metals. *Instrumentation,* v. 7, no. 2, 1954, p. 34-35, 37.

Metals such as lithium, magnesium and antimony of high purity can be produced by distillation under high vacuum. Amount of pressure employed during distillation has important effect on purity. Photograph, diagrams. (C22, Li, Mg, Sb)

88-C. Copper Smelting in Boliden's Rönnskär Works Described. Olov Herneryd, Olof A. Sundstrom and Allan Norro. *Journal of Metals,* v. 6, Mar. 1954, p. 330-337.

Equipment, procedures and economics in single shift operation. Tables, photographs, diagrams. (C21, Cu)

89-C. Current Refractory Practice as Applied in Copper Smelting. William F. Rochow and Lincoln A. McGill. *Journal of Metals,* v. 6, Mar. 1954, p. 338-342.

Although refractories are available which permit reasonable or satisfactory smelting costs, extensive research continues in an effort to develop refractories which will be capable of withstanding even more severe treatment. Graph, diagram. 2 ref. (C21, Cu)

90-C. Copper Converting Practice at American Smelting and Refining Company Plants. F. W. Archibald. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 358-360.

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153-D. Blast Furnace Blowing-In Practice. *American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 12, 1953, p. 216-245.

Includes "Preheating and Blowing-In Practice at the Blast Furnace", R. J. Wilson; "Method of Blowing-In Blast Furnace From Bank", Walter W. Durfee; "Blowing-In Practice at American Steel and Wire Division, Duluth Works", W. A. Abbett, Jr.; and "Blast Furnace Blowing-In and Drying-Out Practices, Bethlehem Plants", H. M. Kraner. (D1)

154-D. Blast Furnace Operation. *American Institute of Mining and Metallurgical Engineers, Proceedings,* v. 12, 1953, p. 246-325.

Includes "Some British Aspects of High-Top-Pressure Operation", R. P. Towndrow and W. Banks; "Distribution of Materials in a Blast Furnace Model", R. L. Stephenson and F. C. Langenberg; "Optimum Composition of Blast Furnace Slag as Deduced From Liquidus Data for the Quaternary System CaO-MgO-Al_2O_3-SiO_2", E. F. Osborn, R. C. DeVries, K. H. Gee and H. M. Kraner; and "Instrumentation for Blast Furnace Research", D. I. Sinizer, J. DePiccolellis and E. R. Poor. (D1)

155-D. (French.) **Induction Stirring in the Electric Arc Furnace Bath.** *Journal du Four Electrique,* v. 63, no. 1, Jan.-Feb. 1954, p. 13-17.

Advantages for steel-producing furnaces. Installations in Sweden and the Timken inductive stirrers in Canton, Ohio. Compares results. Tables, photographs, diagrams. (To be continued.) (D5, ST)

156-D. (German.) **Contribution to Deoxidation Control in Steel.** Walter Koch and Franz Wever. *Stahl und Eisen,* v. 74, no. 5, Feb. 25, 1954, p. 264-271 + 4 plates.

Shows that oxide inclusions cannot be completely avoided. Their nature may be influenced in steel works by simple measures. Graphs, micrographs, photographs, diagram. 6 ref. (D general, ST)

157-D. (German.) **Experiences With Gas Generators With Steam Jackets for Openhearth Furnaces.** Heinz Wübbenhorst. *Stahl und Eisen,* v. 74, no. 5, Feb. 25, 1954, p. 272-279.

Experiments and results. Tables, diagrams, graphs. 8 ref. (D2)

158-D. The Basic Open Hearth Process. I. Some Theoretical Considerations. G. Reginald Bashforth. *British Steelmaker,* v. 20, Mar. 1954, p. 88-93.

Chemical reactions involved in deoxygenizing process and problems of sulfur removal. Graphs. 15 ref. (D2)

159-D. Measuring Dust in Blast Furnace Gas. *British Steelmaker,* v. 20, Mar. 1954, p. 114.

Equipment enables alarm to be sounded if a predetermined dust level is exceeded. Provides continuous record of dust concentration and its variations. Photographs.
(D1, A5)

160-D. Electric Furnace Cuts Costs. R. O. Loomis. *Electrical World,* v. 141, Apr. 5, 1954, p. 152.

Greater availability for charging; speed in making steel; refractory material costs only one-third that of openhearth; higher quality steel. Photograph, diagram. (D5, ST)

161-D. Oxygen Performs Dual Function in Direct Reduction Process. *Steel,* v. 134, Apr. 5, 1954, p. 120.

Method devised for Venezuela producers of iron ore is applicable to fine ores in this country, especially where a supply of coke oven gas is available. Diagram. (D8)

162-D. (Polish.) **Corrosion of Magnesite Refractories in Openhearth Furnaces.** Franciszek Nadachowski. *Hutnik,* v. 21, no. 1, 1954, p. 6-12.

Corrosion mechanism and effect of iron, oxygen and silicon. Table, micrograph, graphs. 8 ref. (D2, Fe)

163-D. (Book.) **American Institute of Mining and Metallurgical Engineers, Proceedings,** v. 12, 1953. 335 p. American Institute of Mining and Metallurgical Engineers, Inc., 29 W. 39th St., New York 18, N. Y. $10.00.

Proceedings of Conference of the Blast Furnace, Coke Oven, and Raw Materials Committee, held in Buffalo, N. Y., Apr. 1953. Agglomeration and beneficiation of iron ores; coal carbonization; blast furnace operation and blowing-in practice.

Sections are separately abstracted. (D1, B general, Fe)

164-D. (Book.) **Comparative Economics of Open-Hearth and Electric Furnaces for Production of Low-Carbon Steel.** 77 p. 1953. Bituminous Coal Research, Inc., 2609 First National Bank Bldg., Pittsburgh 22, Pa. $10.00.

Briefly reviews steelmaking practice. Compares present performance and costs of furnaces, and forecasts future trends. (D2, D5, A4, CN)

E

Foundry

215-E. Costs can be Saved by Controlling Diecasting Temperatures. *Canadian Metals,* v. 17, Mar. 1954, p. 33.

Maintenance of temperature controls and adequate provision of instruments improves die-casting efficiency. (E13, S16)

216-E. Steel Castings Production. *Iron & Steel,* v. 27, Mar. 1954, p. 89-91.

Shop practice including fettling, inspection and foundry service. Photograph, diagrams. (E11, CI)

217-E. Diecasting. New Uses Pace Its Growth. R. L. Hatschek. *Iron Age,* v. 173, Mar. 18, 1954, p. 73-74.

Automatic transmissions help push aluminum die casting to all-time high. Compares production statistics for aluminum, magnesium and zinc die castings. Graph. (E13, Al, Mg, Zn)

218-E. Small Foundry Switches to Shell Molding. J. C. Jensen. *Iron Age,* v. 173, Mar. 18, 1954, p. 148-150.

Equipment, plant layout and operating procedures. Photographs. (E16)

219-E. Titanium Casting. *Iron & Steel,* v. 27, Mar. 1954, p. 102.

Process involves use of vacuum and inert-atmosphere arc-melting furnace and a special, but relatively inexpensive, method of making molds. Photograph, radiograph, table. (E10, E19, Ti)

220-E. Some Examples of Non-Ferrous Castings Produced in Shell Moulds. *Machinery (London),* v. 84, Feb. 19, 1954, p. 378-379.

System used in British foundry. Photographs. (E16)

221-E. Problem: To Reduce Mass Without Sacrificing Rigidity. J. B. Lyons and A. M. Cambell. *Precision Metal Molding,* v. 12, Mar. 1954, p. 38-40, 94-95.

Investment casting, a possible solution, presents advantages over machined and sand cast parts. Photographs, diagram. (E15)

222-E. It Couldn't Be Cast. *Precision Metal Molding,* v. 12, Mar. 1954, p. 41-42, 89-90.

Radio face panel, difficult to die cast, but almost impossible economically by any other method, was recently completed by a small Eastern die casting firm. Photographs. (E13, Al)

223-E. Hand Tool Built With 10 Die Castings. Herbert Charlop. *Precision Metal Molding,* v. 12, Mar. 1954, p. 44-45.

Use of aluminum for its light weight and die casting to lower machining costs. Photographs. (E13, Al)

224-E. Cast Anodes for Cathodic Protection Are 4-Ways Better. Albert Graver. *Precision Metal Molding,* v. 12, Mar. 1954, p. 48-49, 84.

Permanent mold casting allows control of impurities and a more efficient corrosion pattern. Anodes are easier to attach because core wire protrudes from the end. Drawing, table, diagram. (E12, R10, Mg)

225-E. Evaluation of Casting Processes. P. W. Beamer and S. C. Tingquist. *Product Engineering,* v. 25, Mar. 1954, p. 139-144.

Size and weight, physical properties, dimensional tolerances, configuration, activity and cost in selection of best process. Photographs, table. (E general)

226-E. Effective Methods of Inoculating Cast Iron. A. F. Durnienko. *Henry Brutcher, Altadena, Calif., Translation no.* 3162, 4 p. (From *Liteinoe Proizvodstvo,* v. 4, no. 6, 1953, p. 9, 15.)

Difficulties encountered in addition of inoculants to cast iron for a spheroidal graphite structure arise from their low melting and boiling points. (E25, CI)

227-E. The Croning Shell-Molding Process. A New German Development. F. Pölzguter. *Henry Brutcher, Altadena, Calif., Translation no.* 3183, 11 p. (Condensed from *Die Giesserei,* v. 39, no. 19, 1952, p. 467-472.)

Development of process, particulars on molding materials and preparation of patterns and pattern plates. Photographs, diagrams. 2 ref. (E16)

228-E. (French.) **"Shower-Collar" Method Applied During Green-Sand Molding to a Bronze Piece of Large Dimensions.** *Fonderie,* 1954, Jan., no. 96, p. 3775-3777.

Method of molding a bronze piece in the form of a ring-shaped dish. Photographs, diagram. (E19, Cu)

229-E. (French.) **Rejects in the Foundry.** J. Pascal. *Métallurgie et la construction mécanique,* v. 86, no. 1, Jan. 1954, p. 25, 27-29.

Over-all economic viewpoint of an industry. Examples. Diagrams, graphs. (To be continued.) (E general)

230-E. (German.) **Synthetic Molding Sand and Its Application in Gray Iron Foundries.** K. Houben. *Giesserei,* v. 41, no. 4, Feb. 18, 1954, p. 81-86.

Testing at normal and elevated temperatures and application and possibilities. Graphs, photographs. 5 ref. (E18, CI)

231-E. (Hungarian.) **The Hot-Air Cupola Furnace, and Its Present-Day Position.** Ferenc Varga. *Ontöde,* v. 5, no. 1, Jan. 1954, p. 1-9.

Effect of hot air on combustion process, air heating installations, metallurgy of the furnace and advantages in comparison with cold air cupola furnaces. Graphs, diagrams. 29 ref. (E10)

232-E. (Hungarian.) **Problems of the Material for the Charge of Modified Cast Iron.** Gyula Nandori. *Ontöde,* v. 5, no. 1, Jan. 1954, p. 9-17.

High-strength cast irons manufactured under Hungarian conditions of equipment and raw material. Relative merits of cupola and reverberatory furnaces. Diagrams, micrographs, tables. 32 ref. (E10, CI)

233-E. (Hungarian.) **Reasons for Defects in Magnesium Castings and Methods for Their Elimination.** Gyula Emod and Pal Németh. *Ontöde,* v. 5, no. 2, Feb. 1954, p. 41-46.

Factors causing defects. Suggests improved working methods. Photographs, tables. 6 ref. (E general, Mg)

234-E. (Hungarian.) **New Material Standards in Iron Casting.** Péter Dura. *Tobbtermelés,* v. 8, no. 2, Feb. 1954, p. 42-43.

Points taken into consideration when determining standards are design of casting, technology of process used, weight and destination of casting. Categories described. Example of a standard form. Diagram, table. (E general, S22, CI)

235-E. (Swedish.) **Feeding and Solidification. II. Feeders.** K. Akesson. *Gjuteriet,* v. 44, no. 1, Jan. 1954, p. 1-10.

Influence of feeding pressure. Diagrams, graphs, tables. 22 ref. (E23)

236-E. Gating Factors. W. H. Johnson, H. F. Bishop and W. S. Pellini. *Foundry,* v. 82, Apr. 1954, p. 102-107, 271-272.

Simple working concepts the foundryman can apply to practical design of gates. Diagrams, graphs, photographs, radiographs. 9 ref. (E22)

237-E. Progressive Policies Feature Successful Steel Foundry. Robert H. Herrmann. *Foundry,* v. 82, Apr. 1954, p. 108-110, 262-265.

Principles of free enterprise system developed highly efficient working team for production of steel castings. Photographs. (E general, A6, CI)

238-E. Recent Developments in High-Pressure Molding. Tom Barlow and W. R. Adams. *Foundry,* v. 82, Apr. 1954, p. 111, 257-261.

Sand flowability, molding pressure and mold shape, including flask clearance and sand-bearing surface. Diagrams. (E19)

239-E. Cold Cracks in White Iron. E. J. Jory. *Foundry,* v. 82, Apr. 1954, p. 122-123, 266-268.

Causes of cold cracking and hot tearing in production of malleable castings. Outline of mechanism which produces residual stresses. Means by which these stresses may be controlled. Diagrams. (E25, Q25, CI)

240-E. Foundry Specializes in Close-Tolerance Castings. Frank Warga. *Foundry,* v. 82, Apr. 1954, p. 124-127.

Success is attributed to close sand control, care in melting, gating system and a 4-2-1 ratio for risers, runners and sprue. Photographs. (E11, Al, CI, Fe, SS)

241-E. Manganese Bronze Gating Problems. *Foundry,* v. 82, Apr. 1954, p. 128-129.

Castings of manganese bronze should be bottom gated, a runner extension usually added, metal filtered through skim gates or dams to eliminate dross and molds gently filled to avoid folds or scabbing. Photographs. 1 ref. (E22, Cu, Zn)

242-E. Foundry Cuts Costs With Moderate Investment. *Foundry,* v. 82, Apr. 1954, p. 172-173, 175.

Man-hour savings of 62.5% and coke reduction of about 15% resulted from modernization of cupola charging methods. Photographs. (E10)

243-E. Iron and Steel Foundries Regulations 1953; Their Relationship to Safety. George Barnett. *Foundry Trade Journal,* v. 96, Mar. 11, 1954, p. 265-269.

Historical background, main safety provisions, regulations regarding gangways, pouring aisles and dust hazards and shake-out operations. Table. (E general, A7)

244-E. Estimation and Influence of the Gaseous Elements in Cast Iron. L. W. L. Smith and J. V. Dawson. *Foundry Trade Journal,* v. 96, Mar. 4, 1954, p. 233-238, Mar. 11, 1954, p. 275-280.

Formation of hot tears, inverse chill, variations in chilling tendency and differences in annealability of malleable iron as affected by variations in gas content. Tables, photographs, micrographs, graphs. 28 ref. (To be continued.) (E25, CI)

245-E. The Fordath D-Process. *Machinery (London),* v. 84, Mar. 5, 1954, p. 501-505.

Experiments on development of a quick-drying oil and method of blowing shell molds with mixture of this oil and fine silica sand. Photographs. (E16)

246-E. Founding Magnesium-Base Alloys. X. Fundamental Design. XI. Design Factors. M. Caillon. *Metal Industry,* v. 84, Mar. 5, 1954, p. 185-186; Mar. 12, 1954, p. 211-213.

Principal considerations in design of castings. Diagrams, graph, table. (To be continued.) (E general, Mg)

247-E. Pouring Ductile Iron. Ray Orr. *Western Machinery and Steel World,* v. 45, Mar. 1954, p. 91-93.

Gray iron becomes ductile iron when it is inoculated with magnesium alloys. Procedure changes usual graphite structure from flake to spheroidal form. Ductile iron is changed to ferrite form by heating. Photographs, table. (E25, CI)

248-E. (English.) **Faults in Pressure Die Castings. II.** W. M. Halliday. *Metallurgia,* v. 49, no. 292, Feb. 1954, p. 55-60.

Surface and mechanical defects. Photographs. (E13, Q general)

249-E. (German.) **The Ladle Treatment of Cast Iron With Metallic Magnesium.** A. Wittmoser. *Giesserei,* v. 41, no. 5, Mar. 4, 1954, p. 105-108.

Method introduces magnesium chips and granules with a stream of nitrogen or air as means of producing spheroidal graphite. Diagrams, table, micrographs. 20 ref. (E25, CI, Mg)

250-E. (German.) **Reactions on Mold Surface.** H. Reininger. *Giesserei,* v. 41, no. 5, Mar. 4, 1954, p. 109-111.

Effect of casting heat on synthetic molding sand. Gas permeability and shear and compression strength of synthetic compared with natural sand molds. Tables, micrographs, diagram, photograph. 11 ref. (E18)

251-E. (German.) **Investigations on Molding Sands.** E. Wagner, H. Schlichtenmayer, H. Staud and G. Weber. *Giesserei,* v. 41, no. 5, Mar. 4, 1954, p. 111-113.

Effect of vermiculite additions on gas permeability, compression and shear strength of synthetic sand containing bentonite and effect of water content on properties. Tables, graphs. (E18)

252-E. (German.) **The Austenal Lost-Wax Process.** H. J. Marshall. *Giesserei,* v. 41, no. 5, Mar. 4, 1954, p. 120-123.

Strength properties of various as-cast precision castings of cobalt alloy and different steels. Photographs, table. (E15, Co, ST)

253-E. Calcium Carbide Injection. A New Foundry Tool. H. E. Henderson and J. M. Crockett. *American Foundryman,* v. 25, Apr. 1954, p. 34-43.

Finely divided calcium carbide injected into molten iron by means of dry nitrogen removes sulfur, permits use of more economical alloy additions and provides a base for conversion to spheroidal graphite. Diagrams, photographs, tables, graphs, micrographs. 3 ref. (E10, E25, CI)

254-E. Heat Transfer Characteristics of Metals Cast in Shell Molds. R. E. Morey, H. F. Bishop and W. S. Pellini. *American Foundryman,* v. 25, Apr. 1954, p. 46-50.

Solidification characteristics of metals cast into shell molds with back-up are similar to those of sand castings. Without back-up, differences dependent on specific conditions may develop. Photographs, graphs, tables. 3 ref. (E16)

255-E. Pouring Temperature Effect on Steel Castings. C. F. Christopher. *American Foundryman,* v. 25, Apr. 1954, p. 51-55.

Temperature relationship between freezing casting surface and molten core of casting determines susceptibility to porosity. Diagram, photograph, graphs, table. (E23, E25, CI)

256-E. Gating and Risering of Magnesium Alloys. I. H. E. Elliott. *American Foundryman,* v. 25, Apr. 1954, p. 56-62.

Casting defects caused by faulty gating and risering can be minimized using techniques developed by suppliers of magnesium alloy aircraft castings. Diagrams. (To be continued.) (E22, Mg)

257-E. Foundry Facts. Recommended Names for Gates and Risers. *American Foundryman,* v. 25, Apr. 1954, p. 63-65.

Data sheets. (E22)

258-E. Fluidity vs. Core Blows in Automotive Gray Iron. Allen A. Evans. *American Foundryman,* v. 25, Apr. 1954, p. 66-68.

Gas inclusions and porosity trends predicted by measuring iron fluidity with new test. Photographs. (E25, CI)

259-E. Gating Yellow Brass Castings for Greater Production Economy. C. L. Mack. *American Foundryman,* v. 25, Apr. 1954, p. 70-74.

Flexible, effective approach to regating several hundred thin patterns. Photographs, diagrams, table. 6 ref. (E22, Cu)

260-E. The Influence of Casting Temperature on Chill and Mottle Formation. W. J. Williams. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Feb. 1954, p. 136-144 + 4 plates.

With melting temperatures above a certain value, a decrease in casting temperature decreases the chilling tendency. Additions of aluminum accentuate effect of casting temperature. Tables, photographs. 2 ref. (E25, CI)

261-E. A Cause of Cracking in Bath Castings. E. R. Evans and D. McK. Webster. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Feb. 1954, p. 145-159.

Cracking in certain cases is due to presence of abnormally high contents of antimony, boron and lead. Tables, graphs. (E25, CI)

262-E. Segregation of Manganese Sulphide Type Inclusions in Grey Cast Iron. R. Jolly. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Feb. 1954, p. 180-186 + 6 plates.

Occurrence of defects in form of mottled finish associated with small cavities observed on machined casting surface of cylinder casting. Micrographs, tables. 5 ref. (E25, M28, CI)

263-E. Shell Moulding in Action. M. J. Sargeaunt. *Machinery Lloyd (Overseas Ed.),* v. 26, Mar. 13, 1954, p. 71, 73-80.

Effect in increasing productivity, cleanliness and precision of the foundry. Photographs, tables. (E16)

264-E. Diecasting Machine With Cold or Hot Chamber Heads. *Machinery Lloyd (Overseas Ed.),* v. 26, Mar. 13, 1954, p. 103-104.

Recent developments enable good plating results and solid castings to be obtained with certainty. Photograph. (E13, Al, Mg, Zn)

265-E. Some Recent Shell Moulding Developments. *Machinery (London),* v. 84, Mar. 12, 1954, p. 563.

Method of even distribution of resin over surfaces of sand grains and its retention so a strong bond between grains can be obtained when resin is caused to flow by heating during investment and curing stages. (E16)

266-E. Better Aluminum Castings. W. D. Walther, C. M. Adams, Jr., and H. F. Taylor. *Modern Metals,* v. 10, Mar. 1954, p. 44-46.

Research project on improvement of mechanical properties in aluminum castings employs a reduced-pressure test to evaluate melt quality from standpoint of dissolved hydrogen. Photographs, table. 1 ref. (E25, Al)

267-E. Simple Shell Molding Machine. Charles Potter. *Modern Metals,* v. 10, Mar. 1954, p. 50.

Reheating is unnecessary, mold has good continuity and good production is achieved by handling hot plate quickly at dump box and ejector stations. Photograph. (E16)

268-E. Biggest Independent Die Caster. F. L. Church. *Modern Metals,* v. 10, Mar. 1954, p. 66, 68-74, 76.

Success of aluminum die castings points way to expanding sales for die casting industry in general. Graph, photographs. (E13, Al, Zn)

F
Primary Mechanical Working

132-F. Extruded Engine-Rings. P. V. Brown. *Aircraft Production,* v. 16, Mar. 1954, p. 106-110.

Extrusion of heavy-section circular parts for gas turbines. Photographs, diagrams, micrograph. (F24, SG-h, SS)

133-F. Thin Gauge Steel Rolled on Y-Mill in France. *Blast Furnace and Steel Plant,* v. 42, Mar. 1954, p. 336-338.

Equipment, plant layout and operating procedures. Photographs. (F23, ST)

134-F. Mechanized Sheet and Tinplate Mills. John H. Mort. *Iron & Steel,* v. 27, Mar. 1954, p. 83-87.

Study of electrical energy consumption makes clear that motor rating and flywheel design should be determined on basis that entries of packs on twin stands synchronize at all times and peak loads are thus accentuated. Tables, diagram, graphs. (To be concluded.) (F23, ST, Sn)

135-F. Atomic Energy Production Requires Nickel-Plated Pipe. Edgar Altholz. *Machinery,* v. 60, Mar. 1954, p. 166-172.

Making and plating of pipe at western New York plant. Photographs. (F26, L17, Ni)

136-F. Forging Twists and Tricks. H. Winkleman. *SAE Journal,* v. 62, Mar. 1954, p. 27-28.

Based on secretary's report of Panel on Forging, SAE Tractor Production Forum, Milwaukee, Sept. 1953. Gears for automobile and tractor differentials are being completed on forging hammers. U. S. forgers become more enamored of counterblow hammers. Photograph. (F22)

137-F. The Rolling of Metals and Alloys. I. Eustace C. Larke. *Sheet Metal Industries,* v. 31, no. 323, Mar. 1954, p. 241-248.

Historical development of rolling mill. Graphs, photographs, table,

diagram. 11 ref. (To be continued.) (F23)

138-F. Coatings in Cold Forming. Dual Role Makes Lubricant Doubly Important. Samuel Spring. *Steel,* v. 134, Mar. 8, 1954, p. 116-119.

Lubricants have a tough act in severe cold forming. Phosphate combinations are achieving important success in twin function of surface separator and friction reducing agent. Tables, photographs, micrographs. 4 ref. (F1, G21)

139-F. (English.) **The Graphical Representation of the Drawing Process in the Drawing of Wire on Multiple Wire Drawing Machines, With Special Reference to Slip, Accumulation and Die Wear.** F. Liekmeier. *Draht (English Ed.),* 1954, no. 19, Feb., p. 15-18.

Plotting of drawing processes as graphs with logarithmic coordinates shows effects of slip, accumulation and die wear in the various basic types of machines. Graphs. 3 ref. (F28)

140-F. (French.) **Special Aluminum Alloys Obtained by Extrusion and Their Application. II.** Pierre Pétrequin and Michel Costeraste. *Revue de l'Aluminium,* v. 31, no. 206, Jan. 1954, p. 33-41.

Various types of light alloys can withstand special fabrication methods. Limits of length, thickness and profile of the products. Tables, diagrams, graphs. (To be continued.) (F24, T general, Al)

141-F. (German.) **Calculation of Efforts and Power Demand in the Ehrhardt Process of Making Seamless Pipe.** A. Geleji. *Acta Technica Academiae Scientiarum Hungaricae,* v. 7, nos. 3-4, 1953, p. 477-505.

Theoretical and practical principles for design of equipment for Ehrhardt system of making seamless tubing (piercing press and extrusion bench). Diagrams. 7 ref. (F26)

142-F. (German.) **The Hot-Working of Metals.** Erich Siebel. *Zeitschrift für Metallkunde,* v. 45, no. 1, Jan. 1954, p. 1-7.

Resistance of various metals as a function of temperature and rate of deformation; special importance ascribed to temperature increase due to working of light metals; and different types of stress conditions in various working processes. Graphs, tables, photographs. 5 ref. (F general, Al, Cu, Fe, Mg, ST)

143-F. (German.) **Processes in the Hot-Working of Zinc and Zinc Alloys.** Karl Löhberg. *Zeitschrift für Metallkunde,* v. 45, no. 1, Jan. 1954, p. 8-13.

Grain-size reduction as result of hot-rolling or pressing is shown to be ascribed to recrystallization. There is no clear-cut difference between cold and hot working, provided temperature is above room temperature and effect of rate of deformation on plasticity of zinc is taken into account. Graphs, photographs, diagrams. 21 ref. (F23, G1, N5, Zn)

144-F. (Russian.) **Calculation of Forces During Cold Rolling of Shapes With Two Rollers.** V. D. Lisitsin. *Vestnik Mashinostroeniia,* v. 33, no. 11, Nov. 1953, p. 74-77.

Mathematical method of calculating and measuring forces. Diagrams. 6 ref. (F23)

145-F. Forging and Hot Forming. I. George P. Holman. *Industrial Heating,* v. 21, Mar. 1954, p. 474 + 5 pages.

Modern forming methods and equipment. Table. (To be continued.) (F22, G general)

146-F. New Slabbing Mill Speeds Steel Production Cycle. W. G. Patton. *Iron Age,* v. 173, Mar. 4, 1954, p. 151-155.

Efficient processing of bigger ingots, automatic scarfing, speeding up of steel production cycle and increased availability of weldless steel coils are possible. Photographs. (F23, ST)

147-F. Fuel Selection for Soaking Pits. F. R. Pullen. *Iron and Steel Engineer,* v. 31, Mar. 1954, p. 80-82; disc., p. 82.

High air preheat stepped up performance of soaking pit. (F21)

148-F. Use of Oxyacetylene in Rolling Mills. R. L. Deily. *Iron and Steel Engineer,* v. 31, Mar. 1954, p. 83-90; disc., p. 90.

Uses for oxy-acetylene are found to be economical in steel plant operations. Drawings, photographs, graph, table. 6 ref. (F23, ST)

149-F. Direct Rolling of Carbon Steel Ingots to Plates on Three-High and Four-High Plate Mills. Robert C. McMichael. *Iron and Steel Engineer,* v. 31, Mar. 1954, p. 91-99; disc., p. 99-102.

Operations show that the four-high plate mill has many advantages over three-high unit. Tables, diagram, photographs. 12 ref. (F23, CN)

150-F. Titanium Carbide Rod Mill Guides Give Improved Rod Production. *Iron and Steel Engineer,* v. 31, Mar. 1954, p. 121-122.

Equipment and performance characteristics. Photographs. (F27, C-n)

151-F. 16 Percent Aluminum-Iron Alloy Cold Rolled in the Order-Disorder Temperature Range. Joseph F. Nachman and William J. Buehler. *Journal of Applied Physics,* v. 25, Mar. 1954, p. 307-313.

Methods of fabricating from cast slab to thin-gage sheet. Melting, casting, homogenizing, hot rolling and cold rolling at 575° C. and room temperature. Magnetic properties and oxidation resistance. Micrographs, photographs, oscillograms, diagrams, tables, graphs. 9 ref. (F23, P16, R2, Fe, Al)

152-F. How About Fabricating Zinc Coated Steels? Lester F. Spencer. *Tooling and Production,* v. 19, Mar. 1954, p. 41 + 8 pages.

Use and advantages of Sendzimer process for surface protection. Table, photographs. 8 ref. (F23, ST, Zn)

153-F. Titanium Forging Requirements. L. R. Frazier. *Tooling and Production,* v. 19, Mar. 1954, p. 59.

Forging in general and effects on ductility. (F22, Q23, Ti)

154-F. Problems of the Control of Dimension, Shape, and Finish in the Rolling of Sheet and Strip and in the Drawing of Wire. Hugh Ford and J. G. Wistreich. *Institute of Metals, Journal,* v. 82, Mar. 1954, p. 281-290 + 1 plate.

Main sources of variations. Reference to problem of hot rolling as it affects strip and rod. Diagrams, tables, graph. 21 ref. (F23, F28)

155-F. The Control of Quality in the Hot and Cold Rolling of Aluminum and Aluminum Alloys. F. King and A. N. Turner. *Institute of Metals, Journal,* v. 82, Mar. 1954, p. 291-306 + 1 plate.

Theoretical and practical implications of control. Effect of each fabricating process on properties and inspection methods. Graphs, table, micrographs, photograph. 10 ref. (F23, S general, Al)

156-F. The Control of Properties and Structure in the Hot and Cold Rolling of Copper and Copper-Base Alloys. W. W. Kee. *Institute of Metals, Journal,* v. 82, Mar. 1954, p. 307-322 + 1 plate.

Various phenomena arising during processes of rolling and methods of controlling grain size, directionality, shape, gage and surface quality are considered in relation to parts of process by which they are most affected. Charts, graphs, micrographs, photograph. 24 ref. (F23, M27, Cu)

157-F. Some Factors Affecting the Quality of Extrusions. Christopher Smith and Norman Swindells. *Institute of Metals, Journal,* v. 82, Mar. 1954, p. 323-333.

Practice of extrusion in light of effects on quality of copper and aluminum alloy products. Table. 7 ref. (F24, Cu, Al)

158-F. Continuous Crankshaft Press Forging. *Mechanical World and Engineering Record,* v. 134, Mar. 1954, p. 110-111.

Use of rotating furnace with electrically timed hydraulic and mechanical handling appliances. Diagram, photographs. (F22)

159-F. It Doesn't Take a Big Shop to Do a Big Job. D. F. Hammer. *Steel Processing,* v. 40, Mar. 1954, p. 149-155, 195.

Efficient operation of forging plant produces high-quality products. Photographs, diagrams. (F22)

160-F. Internal Stresses in Some Types of Forging. II. Charles Sykes. *Steel Processing,* v. 40, Mar. 1954, p. 168-173, 186.

Transformation characteristics of steel. Cooling rate chosen to meet desired internal stress requirements. Tables, graphs. 3 ref. (F22, Q25, ST)

161-F. West's Largest Steel Tube Drawbench at Pacific Tube Has 150,000 Lb. Pull. *Western Metals,* v. 12, Mar. 1954, p. 48-49.

New bench will draw steel tubing to a maximum length of 52 ft. with an outer diameter as great as 6½-in. Photographs, diagram. (F26, ST)

162-F. (Russian.) **Effect of Form of Working Surface of a Mandrel on the Process of Tube Expansion.** Iu. G. Proskuriakov. *Vestnik Mashinostroeniia,* v. 34, no. 2, Feb. 1954, p. 43-49.

Improves quality of surface. Various parameters and their effects. Diagrams, tables, graphs, photographs. 7 ref. (F26)

163-F. (Book.) **Metal Quality.** 4th Ed. 64 p. 1954. Drop Forging Association, 605 Hanna Bldg., Cleveland 15, Ohio. $1.00.

Latest closed-die forging techniques and new steelmaking practices. (F22)

164-F. (Book.) **Rolling Mills, Rolls and Roll Making.** 108 p. 1953. Mackintosh-Hemphill Co., 901 Bingham St., Pittsburgh 3, Pa. $5.00.

Beginnings of modern rolling, rolling in the U. S., and the story of rolls. Formation of Mackintosh-Hemphill Co., and description of manufacture of cast iron and steel rolls as practiced by the firm. (F23, T5, ST, CI)

G
Secondary Mechanical Working

179-G. Carbon-Dioxide Cooling. *Aircraft Production,* v. 16, Mar. 1954, p. 96-102.

Application as coolant in machining operations, methods of delivery to tool-point and storage. Diagrams, photographs, micrographs, graph. (G21, G17)

180-G. Stretch Aluminum Plate to Reduce Machining Distortion. W. J. Lawler and V. F. Binkley. *American*

Machinist, v. 98, Mar. 15, 1954, p. 128-129.
Controlled stretching has a measurable effect on residual stresses and therefore will minimize, or even eliminate, distortion during extensive machining operations. Tables, photographs. (G17, Al)

181-G. Electrical-Discharge Machining. H. V. Harding, V. E. Matulaitis and R. C. Stoke. *American Machinist,* v. 98, Mar. 15, 1954, p. 137-148.
Report on arc machining describes process, its use, and where it can be applied in fabricating materials that are virtually unmachinable. Photographs, micrographs, osillograms, diagrams. (G17)

182-G. Metal Spinning. I. *Canadian Metals,* v. 17, Mar. 1954, p. 38, 40.
Reviews current literature. (G13)

183-G. Lead-Tin Alloy Coating Improves Workability of Strip Steel. E. J. Roehl. *Iron Age,* v. 173, Mar. 18, 1954, p. 140-142.
Strip steel, electrolytically precoated with a lead-tin alloy, offers important fabricating advantages. Coating acts as a lubricant, reducing wear on dies and forming rolls and eliminates or substantially reduces post-fabrication plating costs. Photographs. (G21, F1, L17, Pb, Sn)

184-G. Automated Units Speed Turning, Gaging. E. J. Egan, Jr. *Iron Age,* v. 173, Mar. 11, 1954, p. 144-145.
Automotive camshafts are automatically processed through two turning and gaging operations on bearing segments. Diagrams. (G17)

185-G. How to Press Form Titanium Parts. Paul Maynard and Andrew Eshman. *Iron Age,* v. 173, Mar. 11, 1954, p. 149-152.
Rubber pad, brake, stretch and drop hammer forming have been used to produce titanium production parts. Photographs, diagrams. (G1, F22, Ti)

186-G. Machining. Change in Tools Cuts Costs, Improves Finish. *Iron Age,* v. 173, Mar. 18, 1954, p. 152.
Improved finish on highly abrasive aluminum bronze die castings and considerably improved tool life attained through use of cemented carbide tooling. Photograph. (G17)

187-G. Permanent Magnets Cast as Close to Final Size as Possible Because of Difficulty in Machining; Use Disc, Centerless Grinders. *Machine and Tool Blue Book,* v. 49, Mar. 1954, p. 213-215.
Alnico is hard, brittle, hot short, impractical to machine and difficult to grind. Machining method is discussed. Photographs. (G17, G18, SG-n)

188-G. Deep Drawing of Molybdenum. F. Duckworth. *Machinery (London),* v. 84, Feb. 19, 1954, p. 389-390.
Molybdenum sheet, 0.010-in. thick, has been drawn into cylindrical cups with a length-to-diameter ratio of more than 2:1 using a new deep drawing technique. Diagrams, table, photograph. (G4, Mo)

189-G. Project Tinkertoy. *Metal Progress,* v. 65, Mar. 1954, p. 81-84.
Mechanized manufacture, inspection and assembly of radio gear, using modules or primary units for each electron tube stage, as evolved by the National Bureau of Standards. (G general, S general)

190-G. Stamping Company Cuts Production Costs by Using Pre-Coated Metal Coil. *Modern Industrial Press,* v. 16, Mar. 1954, p. 38, 40.
Changeover to precoated coil cut costs by one-third. Cleaning, spraying and baking of fabricated trays were eliminated, as were slitting of sheets and stacking of strips. Photographs. (G3)

191-G. Pre-Stressed Steelwork. R. A. Sefton Jenkins. *Overseas Engineer,* v. 27, Mar. 1954, p. 274-276.
Considerable economies in steel and erection costs attained by prestressing, especially if it is outside depth of the beam. Diagram, photographs. 3 ref. (G23, ST)

192-G. Machining Titanium Alloys. *Screw Machine Engineering,* v. 15, Mar. 1954, p. 50-51.
Proper tools for special alloys and working problems. Diagrams. (G17, Ti)

193-G. The Forming of Aluminium Sheet. IV. Deep Drawing and Pressing. H. Hinxman. *Sheet Metal Industries,* v. 31, no. 323, Mar. 1954, p. 191-196, 202.
Diameter reduction of cylindrical, rectangular, tapered and domed shells. Blank-holder pressure, drawing speed, lubrication and ironing. Diagrams, tables, photographs. (To be continued.) (G4, G1, Al)

194-G. (German and French.) **Physical and Technological Basis of Oxygen Cutting.** C. G. Keel. *Zeitschrift für Schweisstechnik,* v. 44, no. 2, Feb. 1954, p. 34-44.
Effects of cutting on ferrous materials. Graphs, tables, diagrams. 15 ref. (G22, Fe)

195-G. (Hungarian.) **Development of Electrical Equipment for Machine Tools.** György Morvay. *Elektrotechnika,* v. 47, no. 2, Feb. 1, 1954, p. 35-49.
Starting control, changing speed and stopping the motion. Possibilities and limits for use of motors with stepless speed control. Diagrams, graphs. (G17)

196-G. (Russian.) **Surface Defects Appearing on Stannous Bronze During Turning.** A. P. Kuznetsov and I. I. Sikhonov. *Vestnik Mashinostroeniia,* v. 33, no. 11, Nov. 1953, p. 56-58.
Low feed, increased speed and a large negative rake will reduce number of defects. Photographs, graphs. (G17, Cu)

197-G. (Russian.) **Die Stamping of Parts From U8 and 3Kh13 Steel.** P. I. Kazakevich. *Vestnik Mashinostroeniia,* v. 33, no. 11, Nov. 1953, p. 65-68.
Forming methods producing best impressions. Chart, photographs, diagrams. (G3, CN)

198-G. (Russian.) **Investigation of the Process of Chip Formation by Using High Speed Movies.** S. V. Egorob. *Vestnik Mashinostroeniia,* v. 33, no. 11, Nov. 1953, p. 70-74.
Method used in Moscow Aviation Institute. Diagrams, photograph, micrographs. 4 ref. (G17)

199-G. Uniform Powder Flow Gives Better Cuts in Stainless. J. R. Kirwin and J. Holmstock. *Iron Age,* v. 173, Mar. 4, 1954, p. 156-157.
Uniform and minimum flow to cutting reaction zone results in consistently good oxy-acetylene cuts in stainless steel. Vibratory feeder dispenses iron powder. Photographs. (G22, SS)

200-G. How Plastics Cut Short Run Tooling Costs. Arthur A. Merry. *Iron Age,* v. 173, Mar. 4, 1954, p. 158-161.
Cast plastics used to advantage in making intricately contoured dies, checking fixtures, drill jigs with steel bushings, milling fixtures, baffle forms and trimline templates. Photographs. (G17)

201-G. Efficient Set-Ups For Operations on Grinding Machine Castings. *Machinery (London),* v. 84, Mar. 5, 1954, p. 471-479.
Methods employed in connection with production of surface grinder. Photographs, diagrams. (G18)

202-G. Magnetic Tape Control of Machine Tools. L. R. Peaslee. *Machinery (London),* v. 84, Mar. 5, 1954, p. 483-489.
Magnetic tape recorders employed to provide signals necessary to control moving members of machine tool throughout operating cycle. Photographs, diagrams. (G17)

203-G. Fabricating Special Purpose Copper Heat Exchangers. J. M. Van Nieukirken. *Materials & Methods,* v. 39, Mar. 1954, p. 140-142.
Flexible, coiled copper tubing offers a means of obtaining high-capacity heat transfer in a small space. Photograph, diagrams. (G general, Cu)

204-G. Machining and Assembling Carbide Header Die Nibs. *Metal-Working,* v. 10, Apr. 1954, p. 16-19.
Bolt heading dies must be designed so formed head of work is not completely confined within carbide nib. Nomograph, diagrams, table. (G17, C-n)

205-G. Guide for Machining Stainless Steels. I. J. D. Armour. *Steel,* v. 134, Mar. 22, 1954, p. 92-95.
Some free-machining types approach workability of bessemer screw stock. Nonfree-machining types offer top mechanical, corrosion properties. Photograph, diagrams, tables. (To be continued.) (G17, SS)

206-G. Rubber Pad Press Gets New Muscles. *Steel,* v. 134, Mar. 22, 1954, p. 98-100.
Working pad is displaced down over work by pumping hydraulic oil into fluid cell. More complete forming results because both face and side pressures are uniform. Photographs, diagrams. (G8)

207-G. Machining Stainless. II. Diagnosis of 274 Tool Headaches. J. D. Armour. *Steel,* v. 134, Mar. 29, 1954, p. 106-108.
Tests on measuring machinability of steel. Photographs. (G17, SS)

208-G. New Tool for Roll Forming. *Steel,* v. 134, Mar. 29, 1954, p. 120-121.
Equipment and performance characteristics. Photographs, diagram. (G11)

209-G. Unconventional Automatic Die Draws Deep Extra-Shells Efficiently. Ernest J. Urbas. *Tooling and Production,* v. 19, Mar. 1954, p. 46-49.
Unorthodox "triple-multiple" die produces three identical finished shells at each stroke of the press. Photographs, diagram. (G4)

210-G. Abrasive Action in Titanium Grinding. Fred A. Upper. *Tooling and Production,* v. 19, Mar. 1954, p. 60-61.
Recommendations based on laboratory experiments and actual field practice for wheel speeds, wheel grit and grade and coolants for different grinding operations. Photographs. (G18, G21, Ti)

211-G. (German and French.) **The Suitability of Different Fuel Gases for Oxygen Flame Cutting.** Hans Georg Kunz. *Zeitschrift für Schweisstechnik,* v. 44, no. 3, Mar. 1954, p. 53-63.
Relative values of acetylene, illuminating gas, propane and hydrogen in flame cutting. Effects on quality of the cut and properties of metals. Diagram, graphs, micrographs, photographs, tables. (To be continued.) (G22)

212-G. Gear-Cutting Savvy in 16 Easy Steps. Richard S. Hildreth. *American Machinist,* v. 98, Mar. 29, 1954, p. 99-103.
Quick, clear-cut introduction to various gear-cutting processes. Photographs, diagrams. (G17)

213-G. Roll Flowing Saves Operation and Conserves Material. Claus L. Sporck. *American Machinist,* v. 98, Mar. 29, 1954, p. 104-107.
Floturn process of metal spinning. Photographs, micrographs, diagrams. (G13)

214-G. Automation Combines Standard Lathes. E. J. Tangerman. *American Machinist,* v. 98, Mar. 29, 1954, p. 110-113.

Two standard lathes equipped with automatic handling take parts from and to conveyor, with interlocked gaging to indicate any tolerance giving trouble. V-shape slide carrier inserts or removes parts from chucks 6 in. deep, retracts to clear cutting zone. Photographs, diagrams. (G17)

215-G. Why Would You Choose Hydraulic Presses? *American Machinist,* v. 98, Mar. 29, 1954, p. 116-126.

Basic reasons for increasing acceptance of modern hydraulic press for jobbing and production work. Diagrams, photograph. (G1)

216-G. The "Dual Coolant" Cooling Method for Grinding. G. Pahlitzsch and J. Applun. *Engineers' Digest,* v. 15, Mar. 1954, p. 91-95. (From *Werkstattstechnik und Machinenbau,* v. 43, no. 11, Nov. 1953, p. 487-494.)

Method utilizes two different fluids supplied to point of contact between grinding wheel and work separately but simultaneously. Graphs, diagrams. 18 ref. (G18)

217-G. Iron Powder Speeds Cutting of Stainless Steel and Non-Ferrous Alloys. R. S. Babcock. *Industry & Welding,* v. 27, Apr. 1954, p. 54-56, 98.

Materials, equipment and techniques of powder-cutting. Photographs. (G22)

218-G. Designing for Oxygen Cutting. John Mattingly. *Industry & Welding,* v. 27, Apr. 1954, p. 66 + 7 pages.

Great progress in application of oxygen cutting made possible by development of precision equipment and widespread acceptance of process. Photographs, diagram. (G22)

219-G. Bore Heavy Tubing Faster on New Trepanning Lathe. *Iron Age,* v. 173, Apr. 1, 1954, p. 129.

Equipment and performance characteristics. Photograph. (G17)

220-G. Planned Safety Reduces Press Accidents. C. E. Meldrum. *Iron Age,* v. 173, Apr. 1, 1954, p. 134-137.

Better press methods and improved safety devices sharply reduce accidents. Photographs. (G1, A7)

221-G. A Study of the Role of the Cutting Fluid in Machining Operations. S. J. Beaubien and A. G. Cattaneo. *Lubrication Engineering,* v. 10, Apr. 1954, p. 74-79.

Cutting fluids studied with object of understanding mechanisms which link fluid properties and metal cutting performance. Photographs, graphs, diagrams. 1 ref. (G21, G17)

222-G. When Drilling 1½" to 5" Holes, Spade Drills Are Economical, Efficient. W. F. Schleicher. *Machine and Tool Blue Book,* v. 49, Apr. 1954, p. 182 + 5 pages.

Compared with twist drills. Use and grinding. Photograph, diagrams. (G17, G18)

223-G. Wheel Characteristics in Relation to Production by Grinding. *Mechanical World and Engineering Record,* v. 134, Mar. 1954, p. 105-107.

Characteristics of grinding wheels, their applications and limitations. Diagrams, tables. (G18)

224-G. Case History no. 14. Machining Stainless Steel. G. J. Stevens. *Modern Machine Shop,* v. 26, Apr. 1954, p. 135.

Problem of threading ends of large sized tubing solved by use of a spider to support tubing in chuck of lathe. Diagram. (G17, SS)

225-G. Floturn Process Is Newest Method for Metal Forming. *Modern Machine Shop,* v. 26, Apr. 1954, p. 136-139.

New spinning process is fast, low-cost and designed to save material. Photographs, diagram. (G13)

226-G. Angularity Control in Large Extruded Shapes. A. J. Naisuler. *Modern Metals,* v. 10, Mar. 1954, p. 61-62.

Die making in extrusion of a modified "J" section. Diagrams. (G5, Al)

227-G. Trepanning Quick Shift to High Gear. *Steel,* v. 134, Apr. 5, 1954, p. 103.

Advantages of adequate horsepower to spindle, high-spindle speed range and high cutting fluid pressures. Photographs. (G17, G21)

228-G. A Quantity Producer Combats Its Limitations. Carter C. Higgins. *Steel,* v. 134, Apr. 5, 1954, p. 118-119.

Stamping industry makes constant progress against its competitive limitations. Under concentrated attack are tool charges, thickness variations, sharp radii and tolerances. Photographs. (G3)

229-G. The Elimination of Safety Hazards in Press Operation. Charles E. Meldrum. *Steel Processing,* v. 40, Mar. 1954, p. 174-180, 184.

Study determined location of hazardous operations and use of mechanical loading and unloading devices, standardization of die design for safety purposes and safety guard design. Table, photographs. 7 ref. (G1, A7)

230-G. Special Automatic Machines, Index Tables Permit Fuze Body Production Savings. M. D. Beals. *Western Metals,* v. 12, Mar. 1954, p. 35-38.

Design and building of special automatic machines to reduce labor costs and insure accuracy. Photographs. (G17)

231-G. (Book.) **New Methods for Sheet Metal Work.** W. Cookson. 4th Ed. 219 p. Technical Press Ltd., Gloucester Road, Kingston Hill, Surrey, London. 16s.

Modernizing and simplifying geometrical development procedure for laying out patterns on an exact basis. Includes two chapters on irregular surface perimeter calculations. (G3)

H — Powder Metallurgy

53-H. Fundamental Study and Equipment for Sintering and Testing of Cermet Bodies. VI. Fabrication, Testing and Properties of 72 Chromium—28 Alumina Cermets. Thomas S. Shevlin. *American Ceramic Society, Journal,* v. 37, Mar. 1954, p. 140-145.

Physical and mechanical properties, impact resistance and thermal effects. Graphs, micrograph, table, photographs. 8 ref. (H11, H15, Cr, Al)

54-H. Cermet Solid Bodies and Coatings for Gas Turbine Engine Blading and Metal Parts. Earle T. Montgomery. *Engineering Experiment Station News (Ohio State University),* v. 26, Feb. 1954, p. 39-40.

Composition and selection of components, properties, techniques and their value. (H general, T25)

55-H. Sintered Parts. *Iron Age,* v. 173, Mar. 11, 1954, p. 164, 166-167, 169.

Manufacture of sintered bronze oil-impregnated bearings. Diagram, photograph. (H15, H16, Cu)

56-H. (Czech.) **Manufacture of Metal Powders by Amalgam Methods.** Jan Kaloc. *Hutnické Listy,* v. 9, no. 2, Feb. 1954, p. 83-88.

Laboratory production of iron, nickel, manganese, cobalt and chromium powder. Diagrams, micrographs. 11 ref. (H10, Fe, Ni, Mn, Co, Cr)

57-H. (Hungarian.) **Heat Treatment of Iron Powder.** Ferenc Kardos. *Magyar Kémiai Folyoirat,* v. 60, no. 2, Feb. 1954, p. 37-42.

Method makes iron powder applicable in telecommunication equipment. Graphs, micrographs. (H10, T1, Fe)

58-H. (Polish.) **Self-Lubricating Iron Bearings.** W. Cegielski. *Prace Instytutow Ministerstwa Hutnictwa,* 1954, no. 6, p. 338-358.

Developments in manufacturing and utilization, effects of pressing pressure, sintering temperature and grain size on properties of the bearings. Diagrams, tables, graphs, micrographs. 9 ref. (H general, T7, Fe)

59-H. Components From Powder. *Aeroplane,* v. 86, Mar. 5, 1954, p. 275.

Production of ferrous and nonferrous parts from sintered metal powders. Photographs. (H general)

60-H. Carbides. *Iron Age,* v. 173, Mar. 4, 1954, p. 170-172.

Single, solid pieces of cemented carbide to 4000 lb. can be produced in a 220-ton hot press capable of producing parts for large die sections, rolls for rolling steel strip, large punches for cold extrusion work and large wear resistant linings for brick molds. Photographs. (H14, T5, C-n)

61-H. A Physical Explanation of the Empirical Laws of Comminution. D. R. Walker and M. C. Shaw. *Mining Engineering,* v. 6; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 199, Mar. 1954, p. 313-320.

Comminution is shown to be basically the same process as metal grinding. 12 ref. (H10, G18)

62-H. (French.) **Determination of the Grain-Size Classification of a Crystalline Powder by X-Ray Diffraction.** René Bernard and Raymond Riviere. *Comptes rendus,* v. 238, no. 6, Feb. 8, 1954, p. 666-669.

Results of experiments with tungsten carbide. Graphs. 5 ref. (H11, W)

63-H. (German.) **Production and Properties of Electrolytic Iron Powder.** Ivan Ljungberg. *Stahl und Eisen,* v. 74, no. 5, Feb. 25, 1954, p. 279-285.

Method through which properties may be varied in a wide range. Table, graphs, diagram. 15 ref. (H11, Fe)

64-H. (Italian.) **Fabrication and Qualities of Sintered Aluminum Powder.** A. von Zeerleder. *Metallurgia italiana,* v. 46, no. 1, Jan. 1954, p. 7-8.

Characteristics, production and uses. (H general, Al)

65-H. Borides Designed for High Temperature Use. Paul Schwarzkopf and F. W. Glaser. *Iron Age,* v. 173, Apr. 1, 1954, p. 138-139.

Sintered borides of zirconium, chromium and molybdenum, developed to meet special defense needs, have potential applications in industry. Table, photograph, graph. (H general, Cr, Mo, Zr)

J — Heat Treatment

116-J. Protection of Hot Work Tools in Heat Treatment. J. Y. Riedel. *Metal Progress,* v. 65, Mar. 1954, p. 85-87.

System where steels can be hardened in uncontrolled atmospheres by copper plating, protecting copper plate during heating by packing in a material which has a carburizing potential. Photograph, table. (J26, TS)

117-J. Surface Hardening Processes for Titanium and Its Alloys. R. W. Hanzel. *Metal Progress,* v. 65, Mar. 1954, p. 89-96.

Based on investigation sponsored by Army Ordnance Corps, Watertown Arsenal, Watertown, Mass., Contract No. DA-11-022-ORD-289. Results of hardening by oxygen, carbon, hydrogen, boron and nitrogen. Graphs, diagram, micrographs, table, photograph. 2 ref. (J28, Ti)

118-J. Nitriding Helps Solve Deep Well Problems. R. L. Chenault and G. E. Mohnkern. *Petroleum Engineer,* v. 26, Mar. 1954, p. 50 + 8 pages.

Hardness, fatigue and corrosion resistance of subsurface equipment improved by new method. Diagrams, graphs, tables, micrographs. 11 ref. (J28, Q29, Q7, R general, AY)

119-J. Portable Base Brightens Annealers' Future. *Steel,* v. 134, Mar. 8, 1954, p. 127-128.

Design permits easy installation and maintenance of single-stack convection furnaces for annealing strip coils. Base mounts on same guide cones as furnace cover. Photographs. (J23)

120-J. Thermal Treatment of Weldments. A. Luthy. *Welding and Metal Fabrication,* v. 22, Mar. 1954, p. 108-111.

Use of heat treatment to reduce internal stresses in constructions subjected to considerable force. Photographs, diagram. (J1)

121-J. Heat Treating the Surface of Welds in Stainless Steel. M. B. Shapiro. *Henry Brutcher, Altadena, Calif., Translation no.* 3187, 7 p. (From *Vestnik Mashinostroeniia,* v. 32, no. 8, 1952, p. 63-65.)

Experimental study on possible elimination of susceptibility of welded stainless steels to intergranular corrosion by treating surface with high-frequency current. Tables, micrographs, diagram. 2 ref. (J2, R2, SS)

122-J. (German.) **Method of Obtaining Intermediate Structures in Medium Sized Chromium-Molybdenum Steel Cylinders.** Walter Eilender and Heinrich Arend. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 85-87.

Tests made in oil, water, and 10% sodium hydroxide quenches. Graphs. 4 ref. (J2, AY)

123-J. (German.) **Hardenability and Testing of Carbon Toolsteels.** Hermann Schottky. *VDI Zeitschrift des Vereines deutscher Ingenieure,* v. 96, no. 6, Feb. 21, 1954, p. 165-170.

Procedure for operators with limited equipment and experience. Graphs, diagrams. 29 ref. (J26, TS)

124-J. (German.) **Hardenability and Temperability of Structural Steels and Their Testing.** Hermann Schottky. *VDI Zeitschrift des Vereines deutscher Ingenieure,* v. 96, no. 7, Mar. 1, 1954, p. 195-202.

Processes discussed and illustrated. Graphs, table, diagram. 41 ref. (J26, J29, ST)

125-J. (Russian.) **Effect of the Rate of Heating on the Formation of Graphitization Centers During the Annealing of Forged Cast Iron.** I. I. Khoroshev. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 221-223.

Longer, continuous heating in temperature range 250 to 420° C. increases number of annealing carbon nodules in modified cast iron. Table. 3 ref. (J23, CI)

126-J. Flame Hardening of Gray Iron Castings. Charles O. Burgess. *Foundry,* v. 82, Apr. 1954, p. 114-121 + 4 pages.

Possibility of improving physical properties, including wear resistance and strentgh, rests on fact that gray iron, like steel, exists in two atomic crystal (allotropic) forms, depending on temperature to which it is heated. Tables, graphs, photographs, diagrams, micrographs. 56 ref. (J2, Q9, Q23, N6, CI)

127-J. Controlled Atmospheres for Heat Treatment of Metals: Methods and Equipment. Ernest S. Lanning, Jr. *Industrial Gas,* v. 32, Mar. 1954, p. 3-6, 19-24.

Atmospheres required for copper, nickel, aluminum, magnesium, precious metals, steel and some of their alloys. Diagrams, graph, table. (J2, Cu, Ni, Al, Mg, ST)

128-J. The Annealing of Copper and Brass Alloys. Arch H. Copeland, Jr. *Industrial Heating,* v. 21, Mar. 1954, p. 444 + 13 pages.

Annealing and use of gas at Revere plant. Photographs, micrographs. (J23, Cu)

129-J. Modern Heat Treat Department Enables Efficient Operation of Sheaffer's New Tool & Die Division. *Industrial Heating,* v. 21, Mar. 1954, p. 460-462, 464.

General view of department illustrates special furnaces, generators and controls used in heat treating tools, dies and various fixtures. Photographs. (J general, TS)

130-J. Let Modern Heat Treatment Turn on the Heat to Turn Down Your Costs. Allen G. Gray. *Steel,* v. 134, Mar. 29, 1954, p. 102-105.

Techniques and equipment which result in economy of materials and production costs. Photographs. (J general, ST)

131-J. Heat Treat Plant Boasts Versatility. *Steel,* v. 134, Mar. 22, 1954, p. 109.

Equipment, plant layout and operating procedures. (J general)

132-J. RF Heating Simplifies Hardening. Ottmar W. Noeske. *Steel,* v. 134, Mar. 15, 1954, p. 120-121.

Hardening of wide variety of sleeves, adaptors, quick-change chucks, boring bars and chuck collets. Photographs. (J2)

133-J. Effect of Heat Treatment Upon the Microstructure and Hardness of a Wrought Cobalt-Base Alloy, Stellite 21 (AMS 5385). F. J. Clauss and J. W. Weeton. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3107, Mar. 1954, 26 p.

Alloy was solution-treated and transformed both by aging and isothermal transformation at temperatures of 1200 to 1950° F. for periods of 5 min. to 72 hr. Graphs, micrographs. 17 ref. (J27, Q29, M27, Co)

134-J. Oxygen in Malleable Iron. L. W. L. Smith. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Feb. 1954, p. 173-179 + 2 plates.

Influence of oxygen content on annealability of white iron for production of malleable iron, using dilatometric technique. Influence of oxygen in presence of aluminum. Graphs, tables, micrographs. 6 ref. (J23, M23, CI)

135-J. Heat-Treatment of High-Speed Steel. III. Further Considerations on the Heating of High-Speed Steel for Hardening. S. G. Cope. *Metal Treatment and Drop Forging,* v. 21, Mar. 1954, p. 123-130, 137.

Final heat treated steel surface is dependent on type of furnace and atmosphere. Effects of variations in austenitizing conditions, such as temperature and treatment, soaking time and type of heating medium. Photograph, graphs, micrographs. 9 ref. (J22, TS)

136-J. Heat Treating Special Trackwork. *Railway Age,* v. 136, Apr. 5, 1954, p. 70-71.

Enlarged facilities at plant provide process for hardening rail, frogs, crossings and switches. Photographs. (J general, CN)

137-J. Smoke Abatement in Metallurgical Furnaces. R. J. Sarjant. *Smokeless Air,* v. 24, Spring 1954, p. 129-131, 136.

Surveys furnace atmospheres and combustion processes in coal or gas-fired heat treating furnaces. (J general, A8)

138-J. Heat Treatment for Tank Turrets. H. Borofsky. *Steel Processing,* v. 40, Mar. 1954, p. 181-184.

General procedure and control mechanism. Photographs. (J general)

139-J. Gears Hardened as They Are Flame-Cut. Glenway Maxon. *Welding Engineer,* v. 39, Apr. 1954, p. 54-55.

Equipment and technique for combining flame-cutting and flame-hardening in single operation. Hardness zone can be precision controlled to meet specifications. Photographs, diagrams. (J2, G22)

140-J. Versatile Steel Carburizing Process Provides Low Cost, Hard Surface Parts. J. B. Froblom and H. W. Hiemke. *Western Metals,* v. 12, Mar. 1954, p. 44-47.

Mechanics of carburization and types of gas furnaces. Graphs, diagram, photographs. (J28)

141-J. (Russian.) **Nitriding Tool Steel.** A. N. Serov. *Stanki i Instrument,* v. 24, no. 9, Sept. 1953, p. 18-20.

Nitriding at 550° C. for 25 to 30 hr. results in formation of layer of sufficient depth to permit increased cutting speed. Graphs, tables. (J28, G17, TS)

142-J. (Russian.) **Use of Cyaniding in Mass Production.** K. V. Kosov. *Vestnik Mashinostroeniia,* v. 34, no. 2, Feb. 1954, p. 62-65.

Temperature of bath, duration, concentration of cyanide, and number of pieces cyanidized simultaneously. Diagrams, graphs, photograph. (J28, ST)

K Joining

246-K. Journal Boxes Welded Economically. *Canadian Metals,* v. 17, Mar. 1954, p. 42, 44.

Journal boxes for railroad rolling stock produced economically by automatic welding of two steel halves. Photographs. (K1, CN)

247-K. Welding by the Harman Process. A Staff-Industry Report. *Canadian Metals,* v. 17, Mar. 1954, p. 48-49.

Equipment and techniques of repairing cast iron following fracture or cracking. Photographs. The Harman process is a mechanical weld or "metal stitching" process. (K13, CI)

248-K. Application of Pressed Powder Technique for Production of Metal-to-Ceramic Seals. Walter Knecht. *Ceramic Age,* v. 63, Feb. 1954, p. 12-13; disc., p. 13.

Past work and present advantages of method in electron tube manufacture. (K11)

249-K. Hardness Prediction in Welding. Roy B. McCauley, Jr. *Engineering Experiment Station News (Ohio*

State University), v. 26, Feb. 1954, p. 41-44.

Hardness traverse can be predicted from chemical compositions, shape of work and heat imput of the weldment. Graphs, diagram. 7 ref. (K general, Q29)

250-K. Microcracks in Weld Metal. P. C. Van Der Willigen. *Journal of Scientific & Industrial Research,* v. 13, sec. A, Jan. 1954, p. 26-30.

"Flakes" caused by presence of hydrogen and effect of cooling rate and composition on embrittlement of weld metal. Micrograph, tables. 4 ref. (K general, Q23)

251-K. Shielded-Arc Techniques Dominate Ryan Fusion Welding. *Machinery,* v. 60, Mar. 1954, p. 180-185.

Evaluates three techniques for welding aluminum and magnesium alloy aircraft engine parts. Photographs. (K1, Al, Mg)

252-K. New Welding Tools Rate a Chance to Show Their Stuff. Quentin Ingerson. *SAE Journal,* v. 62, Mar. 1954, p. 59-60.

Based on secretary's report of Panel on Welding, Milwaukee Production Forum, Sept. 1953. Reviews sigma and submerged-arc welding and use of low-hydrogen electrodes. Photograph. (K1)

253-K. Resistance Welding of Coated Mild-Steel Sheet. A. J. Hipperson. *Sheet Metal Industries,* v. 31, no. 323, Mar. 1954, p. 211-218.

Various welding problems caused by presence of coatings in mild steel. Recommends ways to obtain best results. Diagrams, tables, graphs. 5 ref. (K3, ST)

254-K. For the Younger Craftsman —Welding. F. Koenigsberger. *Sheet Metal Industries,* v. 31, no. 323, Mar. 1954, p. 219-222.

Guide to examination requirements. Welding technology. Diagrams. (To be continued.) (K general)

255-K. The Welding of Nickel and High Nickel Alloys. Lester F. Spencer. *Sheet Metal Worker,* v. 45, Mar. 1954, p. 71-72, 93.

Metallic, automatic - submerged, carbon and inert-gas metallic-arc welding. Table, photograph. (To be continued.) (K1, Ni)

256-K. Distortion Can be Designed Out of Welded Structures. J. R. Stitt. *Steel,* v. 134, Mar. 8, 1954, p. 120-122.

Understanding what happens in heat affected zones is tipoff to effective procedures for ending warpage and upsetting. Heat can straighten distorted members. Diagrams, photographs. (K9)

257-K. Electrode Materials for Resistance Welding. W. J. Armstrong and H. D. Baer. *Welding and Metal Fabrication,* v. 22, Mar. 1954, p. 95-97.

Right choice and design of electrode materials will increase life of electrode and benefit quality of welds. Diagrams, tables. (K3, T5)

258-K. Effect of Surface Conditions on Porosity and Mechanical Properties of Weld Metal. K. Winterton. *Welding and Metal Fabrication,* v. 22, Mar. 1954, p. 101-104.

Effects of light machine oil, gas-cut edges, rust and scale on plate surface. Tables, photographs, diagram. 3 ref. (K general, Q general, CN)

259-K. New Developments in Sigma Welding of Carbon Steel. T. McElrath and R. T. Telford. *Welding Journal,* v. 33, Mar. 1954, p. 201-207.

Improved torch handling technique plus specially deoxidized wire promises elimination of porosity. Tables, graph, diagrams, radiographs. 3 ref. (K1, CN)

260-K. Maintenance Welding in the Petroleum Industry. Don H. Rasmussen. *Welding Journal,* v. 33, Mar. 1954, p. 213-222.

Review of welding principles including identification of base metal, calculation of effect of heat to be applied, design of joint to be repaired and selection of filler metal. Photographs, diagrams. (K general)

261-K. Tell-Tale Damage Reveals Significance of Welded Ship Construction. T. D. Beery and LaMotte Grover. *Welding Journal,* v. 33, Mar. 1954, p. 234-236.

Information from examination of damage resulting from collision of ships includes strength of materials used, effectiveness of tools and techniques employed and quality of skill and craftsmanship. Photographs. (K general, ST)

262-K. Balancing Ignitrons in Frequency Converter Three-Phase Spot Welder. G. C. Woodmancy. *Welding Journal,* v. 33, Mar. 1954, p. 236-238.

Method using cathode-ray oscilloscope permits checking balance of inverse parallel connected ignitrons and making necessary adjustments in less than an hour without welding or subsequent testing. Diagrams. (K3)

263-K. Fast Welding Done on Floors for Army Cargo Trailers. Herbert Chase. *Welding Journal,* v. 33, Mar. 1954, p. 242-244.

Initial assembly is by sequence of spot welds. Main seams on four sides of central sheet are automatically submerged-arc welded by four heads that move 72 in. per min. after work is clamped in special machine. Photographs. (K3, K1, CN)

264-K. Soldering of Aluminum. J. D. Dowd. *Welding Journal,* v. 33, Mar. 1954, p. 113S-120S.

Preparation of soldered joints in aluminum and its alloys and resistance to corrosion. Graphs, tables, photograph. 11 ref. (K7, R general, Al)

265-K. Effect of Atmospheric Contaminants on Arc Welds in Titanium. J. C. Barrett and I. R. Lane, Jr. *Welding Journal,* v. 33, Mar. 1954, p. 121S-128S.

Effect of oxygen, nitrogen, hydrogen and water vapor on physical properties of inert-gas-shielded tungsten-arc welds. Tables, graphs, photographs. (K1, Q general, Ti)

266-K. Effect of Reinforcement on Performance of Weldments. Carl E. Hartbower. *Welding Journal,* v. 33, Mar. 1954, p. 141S-146S.

Reinforcement has tendency to raise transition temperature of a weldment. Its removal in critical areas may sometimes be desirable. Photographs, graphs, micrograph. 3 ref. (K general, Q23, CN)

267-K. Fusion Welding of Commercially Pure Titanium. Francis H. Stevenson. *Welding Journal,* v. 33, Mar. 1954, p. 147S-153S.

Techniques for producing acceptable welds by inert-gas-shielded tungsten-arc method. Photographs, tables, graph. (K1, Ti)

268-K. Cold Arc Welding of Gray Cast Iron Using a Granular Flux and Gray-Iron Electrodes. A. I. Zelenov. *Henry Brutcher, Altadena, Calif., Translation no.* 3154, 8 p. (From *Avtogennoe Delo,* v. 24, no. 4, 1953, p. 7-9.)

Welds, using either a.c. or d.c., are identical with base metal, easy to machine and free from hard spots. Micrographs, photographs, diagrams, graph, tables. (K1, CI)

269-K. (French.) **Importance of Design in Welding.** H. Gerbeaux. *Soudure et Techniques connexes,* v. 8, nos. 1-2, Jan.-Feb. 1954, p. 9-18.

Deformations and stresses due to shrinkage. Suggestions for welded static structure, choice of materials, orientation of welds and preheating and post heating. Drawings. (K general)

270-K. (French.) **Application of Welding to Fabrication of Interchangeable Structural Elements.** P. Lorin. *Soudure et Techniques connexes,* v. 8, nos. 1-2, Jan.-Feb. 1954, p. 19-22.

Techniques for welding metal bridge girders. Photographs. (K general)

271-K. (French.) **Reports of Committee Chairmen of the International Institute of Welding on Papers Presented at Copenhagen, Denmark, Annual Meeting, July 5-10, 1953.** *Soudure et Techniques connexes,* v. 8, nos. 1-2, Jan.-Feb. 1954, p. 25-34.

Includes gas and resistance welding; standardization; health and safety; brittle fracture; fatigue tests; and teaching of welding. (K2, K3, Q26, Q7, A7)

272-K. (Russian.) **Novel Method of Speeding Up Manual Arc Welding.** L. Gillemot. *Acta Technica Academiae Scientiarum Hungaricae,* v. 7, nos. 3-4, 1953, p. 277-292.

Principle of double rod welding. Tests show 40 to 50% economy in energy consumption. No special coating is required on welding rods. Diagrams, tables. (K1)

273-K. (Russian.) **Automatic Copper Welding Under Flux.** K. V. Bagrianskii. *Vestnik Mashinostroeniia,* v. 33, no. 11, Nov. 1953, p. 85-86.

Results show that welding with copper electrodes produces seams of good mechanical properties. Photograph, micrograph, tables. 5 ref. (K1, Q general, Cu)

274-K. Nitrogen-Arc Welding of Copper. Edwin Davis and C. A. Terry. *British Welding Journal,* v. 1, Feb. 1954, p. 53-64.

Factors influencing arc stability and tungsten transfer across arc. Reasons for greater power of nitrogen-shielded arc compared with argon-arc. Diagrams, tables, graphs, radiographs, micrographs. 19 ref. (K1, Cu)

275-K. Spot Welding of Low-Alloy High-Tensile Steels. P. Joumat. *British Welding Journal,* v. 1, Feb. 1954, p. 64-65.

Torsion shear test is simple and practical method of determining quality of heat-treated spotweld. Graphs, table, diagrams. 3 ref. (K3, Q1, AY)

276-K. Reports of I.I.W. Commission 13. H. de Leiris. **Commission 9.** H. G. Geerlings. **Commission 4.** L. Blosset. **Commission 6.** F. M. L. van Horenbeeck. *British Welding Journal,* v. 1, Feb. 1954, p. 66-69.

Specifications for fatigue tests on welds, weldability tests, documentation of welding literature and welding terminology. (K9, Q7, A10)

277-K. Self-Adjusting Welding Arcs. J. C. Needham and W. G. Hull. *British Welding Journal,* v. 1, Feb. 1954, p. 71-77.

Based on E.R.A. Report Z/T91. Control of arc length in self-adjusting arcs with respect to changes in electrode-feed rate, current setting and open-circuit voltage. Graphs. 9 ref. (K1)

278-K. Nitrogen-Arc Welding of Copper. K. Winterton. *British Welding Journal,* v. 1, Feb. 1954, p. 87-90.

Sound butt welds have been made in ½-in. arsenical deoxidized copper plate using nitrogen-arc welding. Photograph, table, micrographs. 4 ref. (K1, Cu)

279-K. Welding in South Africa. F. J. A. van Reenen. *British Welding Journal,* v. 1, Mar. 1954, p. 101-105.

Survey of development of welding and production of welding equipment in South Africa. Applications

of welding in some major industries. Photographs. (K general)

280-K. Investigations on Pressure Welding. R. F. Tylecote. *British Welding Journal,* v. 1, Mar. 1954, p. 117-135.

Principles of pressure or solid-phase welding. Investigates connection between weldability of various metals at room temperature and physical properties of oxide film. Tables, diagrams, micrographs. 27 ref. (K5, K9, P general)

281-K. Resistance Spot Welding of 3/16 and ¼ In. Mild Steel. J. E. Roberts. *British Welding Journal,* v. 1, Mar. 1954, p. 136-140.

Techniques of process as reported in literature. Graphs, tables, photographs. 12 ref. (K3, CN)

282-K. Faster Fusion. II. Inert Gas-Shielded Metal Arc Welding and Submerged Arc Welding. J. R. Fullerton. *Finish,* v. 11, Apr. 1954, p. 55-56.

Method of operation at aircraft plant. Photographs. (K1)

283-K. How to Braze Beryllium. M. J. Zunick and J. E. Illingworth. *Materials & Methods,* v. 39, Mar. 1954, p. 95-97.

Techniques proven successful in overcoming oxidation and insuring sound joints. Diagrams, photographs, micrograph. 12 ref. (K8, Be)

284-K. An Apparatus for Protection Against Dangerous Voltages in Welding Equipment. F. H. de Jong and D. W. van Rheenen. *Philips Technical Review,* v. 15, Jan. 1954, p. 199-204.

Based on principle of a voltage divider, which lowers voltage between welding rod and grounded work while no welding is taking place, but cuts out automatically as soon as welding is started. Graph, diagrams, photographs, oscillograms. 2 ref. (K1)

285-K. Hidden Arc Speeds Sheet Section Welding. *Steel,* v. 134, Mar. 22, 1954, p. 112.

Machines lay down sound, uniform welds at speeds of 70 in. per min. Fast metal deposition minimizes sheet warpage on railroad car body sections. Photographs. (K1, AY)

286-K. Tin in Automobile Body Construction. Homer C. Pratt. Paper from "Symposium on Tin". ASTM Special Technical Publication no. 141. p. 52-55; disc., p. 56.

Solder and flux compositions and methods of application of tin solders. (K7, T21, Sn)

287-K. (English.) **Recent Developments in the Riveting of Aluminium.** A. W. Brace. *Metallurgia,* v. 49, no. 292, Feb. 1954, p. 71-75.

Alloys suitable for use as rivets and design of preformed and driven heads. Tables, diagrams, graph, photographs. 11 ref. (K13, Al)

288-K. Testing Steels for Weldability. R. G. Braithwaite. *British Welding Journal,* v. 1, Feb. 1954, p. 70.

Bend test to determine weldability of steel. Table, photographs. (K9, ST)

289-K. (French and German.) **The Argomat. A New High-Duty Device for Protective-Gas Welding With Consumable Electrode.** M. E. Witting. *Zeitschrift für Schweisstechnik,* v. 44, no. 3, Mar. 1954, p. 64-70.

Requirements and operation. Method well suited for welding aluminum, copper and stainless steel. Diagrams, photographs, table, graph. (K2, Al, Cu, SS)

290-K. How Stored-Energy Resistance Welding Joins Dissimilar Metals. Thomas A. Dickinson. *Industry & Welding,* v. 27, Apr. 1954, p. 40-42, 84-85.

Materials, equipment and operating characteristics. Photographs, table. (K3)

291-K. Automatic Welding Builds 28-Ft. Stainless Steel Bellows. *Industry & Welding,* v. 27, Apr. 1954, p. 44 + 5 pages.

Bellows made by forming raw metal and welding convolutions to each other and to the necessary pipe ends. Photographs. (K1, SS)

292-K. A Guide to Pipe Welding Layout. III. Dorsey B. Thomas. *Industry & Welding,* v. 27, Apr. 1954, p. 59-60, 62-63.

Outlines methods for five-piece 90° turn, three-piece 60° turn and division of a 90° tube turn. Diagrams. (K general)

293-K. Use Low Hydrogen Electrodes to Repair Alloy Steel Castings. F. R. Drahos. *Industry & Welding,* v. 27, Apr. 1954, p. 77-78, 81, 83.

Equipment, materials and techniques. Photographs, table. (K1, AY)

294-K. A Guide to Fabricating Magnesium by Manual Inert Arc Welding. *Industry & Welding,* v. 27, Apr. 1954, p. 86-87.

Data sheet. Diagrams. (K1, Mg)

295-K. Automatic Welder for Aluminum Pipelines. *Steel,* v. 134, Apr. 5, 1954, p. 114.

Equipment and operating techniques. Photographs. (K1, Al)

296-K. Nickel-Lined Ship for Liquid Chemicals. Herman C. Phelps. *Welding Engineer,* v. 39, Apr. 1954, p. 41-44.

Welding and construction procedures, inspection methods and performance expectations. Photographs, diagram. (K general, Ni)

297-K. Are You Getting the Most From Your Electrode Dollar? M. O. Monsler. *Welding Engineer,* v. 39, Apr. 1954, p. 46-48, 53.

Stub losses, overwelding, poor fit-up and welding out of flat position may be responsible for inefficiency. Charts, tables, diagrams. (K1)

298-K. Practical Design for Welding. I. Rex Cleveland. *Welding Engineer,* v. 39, Apr. 1954, p. 50-53.

Materials, weld types and sizes and strength requirements of members for tension, compression and shear loadings. Diagrams. (K general)

299-K. Brazing in Action. *Welding Engineer,* v. 39, Apr. 1954, p. 56-57.

Historical developments, theory of mechanism, materials, equipment, techniques and factors influencing good brazing. Photographs. (K8)

300-K. Here's the Way Storts Welding Repairs Heavy Iron Castings. Harold S. Card. *Welding Engineer,* v. 39, Apr. 1954, p. 58-60, 66.

Equipment and techniques for producing weld structure that can hardly be distinguished from structure of parent metal. Photographs. (K general, CI)

301-K. 77 Years of Resistance Welding. III. Preston M. Hall. *Welding Engineer,* v. 39, Apr. 1954, p. 62-63.

Development of electronic control. Photographs. (K3)

302-K. Two Arcs and Helium Speed Job. *Welding Engineer,* v. 39, Apr. 1954, p. 64, 66.

Use of thoriated-tungsten electrodes contributed to faster production welding on boxes of aluminum for portable radios. Photographs. (K1, Al)

303-K. Self-Retaining Fasteners Give 30-50% Production and 30% Cost Savings. Cliff Mohr and Al Alcaraz. *Western Metals,* v. 12, Mar. 1954, p. 58-60.

Specifying self-retaining fasteners or Speed Nuts can result in reductions of materials and materials handling, elimination of welding, clinching or staking, savings in production time and improved worker efficiency. Photographs. (K13)

304-K. (Russian.) **Cold Welding of Cast Iron.** Ia. Ia. Sineok, M. S. Baranov, L. A. Pankul, L. S. Sapiro, I. Z. Kagan, P. A. Glukhov, V. I. Mikhin and A. S. Kirpichev. *Vestnik Mashinostroeniia,* v. 34, no. 2, Feb. 1954, p. 68-79.

Experiences of various authors on use of different electrodes. Advantages and disadvantages of process. Diagrams, micrographs, photographs, table. (K1, CI)

305-K. (Russian.) **Properties of Welded Joints Made With Basic and Neutral Electrode Coatings.** Antonin Benesk. *Vestnik Mashinostroeniia,* v. 34, no. 2, Feb. 1954, p. 80-81.

Basic coatings permit improved vertical and overhead welding. Table, graphs. (K1, CN)

306-K. (Book.) **Joining Magnesium.** 126 p. 1953. Dow Chemical Co., Midland, Mich.

Welding methods; adhesive bonding; mechanical joining; brazing; soldering; protection of assemblies from corrosion. (K general, R general, Mg)

307-K. (Book.) **Simple Blueprint Reading With Special Reference to Welding.** 207 p. 1953. Lincoln Electric Co., 12818 Coit Rd., Cleveland 17, Ohio. $1.00, U.S.A. $1.50, elsewhere.

Published as a service to the welding industry for educational purposes. Welding symbols as standardized by the American Welding Society. (K general)

L
Cleaning, Coating and Finishing

331-L. Al-Fin in Aeronautical Engineering. *Aeroplane,* v. 86, Feb. 26, 1954, p. 247-248.

Method for bonding cast iron, steel and similar materials to aluminum and its alloys. Mechanical and physical properties of the bond. Photomicrograph, photographs. (L22, Al, CI, ST)

332-L. Hard Facing in Ceramic Industries. William L. Lutes and Harry F. Reid. *American Ceramic Society, Bulletin,* v. 33, Mar. 1954, p. 79-82.

Proposed classification system for hard facing alloys. Selection of alloys for surfacing ceramic manufacturing equipment. Tables, photographs, graph. (L24)

333-L. Barrel Finishing. . .More Art Than Science. Leonard Giglio. *American Machinist,* v. 98, Mar. 15, 1954, p. 125-127.

There is "one best way" for each material, finish, part size and shape and desired result. Method is set up for versatility as well as efficiency. Photographs. (L10)

334-L. New Aircraft Coating for Corrosion Prevention. M. W. Larson. *Aviation Age,* v. 21, Feb. 1954, p. 62-65.

Epoxy resin paint developed to give resistance to Skydrol hydraulic fluid was found to be an excellent protective coating for use in exhaust path areas as well. Table, graphs. (L26)

335-L. The Protective Action of Pigments on Steel. M. J. Pryor. *Electrochemical Society, Journal,* v. 101, Mar. 1954, p. 141-148.

Action of aqueous extracts from litharge, metallic and red leads, basic lead carbonate and zinc and zinc oxide on corrosion of steel was investigated. Tables, graphs, diagram. 24 ref. (L26, R general, ST)

336-L. Electrochemical and Electrometallurgical Industries of Canada. IV. Saskatchewan, Alberta, British Columbia, the Yukon, and Northwest Territories. A. C. Holm. *Electrochemical Society, Journal,* v. 101, Mar. 1954, p. 67C-72C.

Present state and future trends. Photograph. (L17, C23)

337-L. Anodic Oxide Films on Tantalum Electrodes. I. Thickness and Current Efficiency of Formation. II. Field and Ionic Current During Formation. III. Photo Effects. L. Young. *Faraday Society, Transactions,* v. 50, Feb. 1954, p. 153-171.

Oxide films from few tens to several thousand Å in thickness can be produced on tantalum electrodes by anodic polarization. Part I: Methods of determining thickness of films. Part II: Kinetics of formation process. Part III: Photo effects. Diagram, tables, graphs. 34 ref. (L19, Ta)

338-L. Silver and Gold Plated Finishes. *Industrial Finishing (London),* v. 6, Feb. 1954, p. 480-491.

Review of small lot plating processes. Applications. Photographs. (L17, Au, Ag)

339-L. Temporary Protective Coatings. *Industrial Finishing (London),* v. 6, Feb. 1954, p. 501-504.

Reviews scope, nature and efficiency of available systems for protection against corrosion during temporary storage or idle periods. Table. (L general)

340-L. Corrosion and Preservation of Industrial Steelwork. L. A. Ravald. *Industrial Finishing (London),* v. 6, Feb. 1954, p. 508-514, 520, 522, 524, 526.

Corrosion of mild structural steel and protection by various coatings. Photographs, table, chart. (L general, R general, CN)

341-L. Zinc Plate on Cartridge Cases Meets Rigid Specifications. C. E. Fisher and D. F. Zlatnik. *Iron Age,* v. 173, Mar. 11, 1954, p. 135-139.

Equipment and techniques of process. Table, diagram, photograph. (L16, Zn)

342-L. Deburring: Modern Methods, Tools Cut Costs. I. John E. Hyler. *Iron Age,* v. 173, Mar. 11, 1954, p. 140-143.

Improved methods, equipment and tools can cut costs of operation. Photographs, diagrams. (L10)

343-L. Electrical Measurements in the Study of Immersed Paint Coatings on Metal. I. Comparison Between Capacitance and Gravimetric Methods of Estimating Water-Uptake. D. M. Brasher and A. H. Kingsbury. *Journal of Applied Chemistry,* v. 4, Feb. 1954, p. 62-72.

Includes graphs, tables. 6 ref. (L26)

344-L. Chromium-Plating Gun Bores. C. E. McDowell. *Machinery (London),* v. 84, Feb. 26, 1954, p. 437-441.

Equipment and operating procedures. In addition to hardness, electrodeposited chromium shows low coefficient of friction, good corrosion resistance and high seizure resistance. Photographs. (L17, Cr, ST)

345-L. Industrial Hard-Chromium Plating. Warren Schmidt and William E. Hogan. *Mechanical Engineering,* v. 76, Mar. 1954, p. 248-254.

Facts mechanical engineers should know about modern plating techniques. Photograph, tables, graph. (L17, Cr)

346-L. Electro-Osmotic Examination of Paint Films. II. J. K. Wirth and Willi Machu. *Paint, Oil & Chemical Review,* v. 117, Mar. 11, 1954, p. 26-29, 44.

Equipment and techniques for measuring porosity of films. Results explain some aspects of corrosion under protective coatings. Tables, diagram, graph. 6 ref. (L26)

347-L. A.E.S. Research Report: Project no. 12. Cleaning and Preparation of Metals for Electroplating. VIII. Effect of Oxide Films. A Survey of Literature. Henry B. Linford and David O. Feder. *Plating,* v. 41, Mar. 1954, p. 279-286.

Summarizes previous work on effects of electroplating onto oxide-soiled basis metals. (To be continued.) (L17, L12)

348-L. Ultrasonic Cleaning. *Precision Metal Molding,* v. 12, Mar. 1954, p. 65-66.

Application of ultrasonic energy for agitating action, in combination with correct solvent degreasing cycle, is one of the newer methods of cleaning soil from metal surfaces. Photographs. (L10)

349-L. $22,500 Saved Each Year in Cleaning Dies. *Precision Metal Molding,* v. 12, Mar. 1954, p. 69-70.

Cleaning method of blasting with nonmetallic abrasives suspended in liquid. Photograph. (L10)

350-L. Paint Specifications for Metal Products. Paul E. Marling. *Product Engineering,* v. 25, Mar. 1954, p. 173-181.

Recommends finish formulations and application procedures for eight major classes of industrial products. Specific information connecting properties and composition. Photographs, table. 9 ref. (L26)

351-L. Flow Coating Range and Heater Parts. Ezra A. Blount. *Products Finishing,* v. 18, Mar. 1954, p. 24-31.

Flow coating is a paint finishing process that lends itself well to mechanized finishing. Photographs, diagram. (L26)

352-L. Spotlighting Finishing Progress. Seymour Senderoff. *Products Finishing,* v. 18, Mar. 1954, p. 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 74, 76, 78, 80.

Finishing of aluminum, finishing aluminum die castings and formation of immersion zinc coatings on aluminum. Photographs, tables, graphs, diagrams. (L general, Al, Zn)

353-L. Chemical Polishing of Steel. W. A. Marshall. *Research,* v. 7, Mar. 1954, p. 89-93.

Surfaces of ferrous materials may be smoothed and polished by chemical method which has advantages over electropolishing process. Technique has applications to both engineering and decorative manufactures. Oscillograms, graph, table, micrographs, photograph. (L12, ST)

354-L. Surface Treatment and Finishing of Light Metals. IX. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 31, no. 323, Mar. 1954, p. 223-226.

Organic finishing of aluminum and its alloys. Photographs. (To be continued.) (L26, Al)

355-L. Hot Dip Galvanizing. III. Materials and Methods. K. S. Frazier. *Steel,* v. 134, Mar. 8, 1954, p. 138-139.

To protect advantages of controlled hot dip galvanizing, all phases of base materials and preparatory processes must be thoroughly investigated. Micrographs, photographs, table. (L16)

356-L. (English.) **The Development of the Chromising Process.** Karl Daeves. *Draht (English Ed.),* 1954, no. 19, Feb., p. 30-32.

Chromizing process and its advantages in industry. Photograph. (L15, Cr)

357-L. (French.) **Continuous Galvanizing of Steel Strips.** M. A. Ollivet. *Métallurgie et la construction mécanique,* v. 86, no. 1, Jan. 1954, p. 49-51.

With respect to output, economy, quality and employees' working conditions. Photograph, diagram. (L16, ST, Zn)

358-L. (French.) **New Development in the Regeneration of Pickling Baths.** Jean Labergere. *Métallurgie et la construction mécanique,* v. 86, no. 2, Feb. 1954, p. 127-128.

Ruthner process whereby baths used are continuously concentrated by evaporation and contact with gaseous hydrochloric acid. Diagrams. (L12)

359-L. (French.) **Research on the Galvanizing of Cooking Utensils.** A. Gordet. *Métallurgie et la construction mécanique,* v. 86, no. 2, Feb. 1954, p. 129-131.

Compares weights of utensils before and after galvanizing. Tables. (To be continued.) (L16, Zn)

360-L. (French.) **General Remarks on the Production of Tin Plate.** Louis Gascuel. *Métallurgie et la construction mécanique,* v. 86, no. 2, Feb. 1954, p. 133-135.

Production methods, tin coating, electrolytic tinning and various kinds of tin plate. Diagram, photographs. (L16, L17, Sn, ST)

361-L. (French.) **Protection of Aluminum and Its Alloys With Paints. I.** André Guilhaudis and Régine Bourbon. *Revue de l'Aluminium,* v. 31, no. 206, Jan. 1954, p. 7-10.

Importance of proper surface preparation. Various cleaning methods and coatings. Photographs. (To be continued.) (L26, Al)

362-L. (German.) **Chemical Polishing.** H. Spähn. *Metalloberfläche,* Ausgabe B, v. 6, no. 2, Feb. 1954, p. 17-26.

Bath composition for aluminum and copper alloys. Graphs, micrographs, photographs, table. 10 ref. (L12, Al, Cu)

363-L. (Russian.) **Adhesion of Zinc Coats to Basic Metal.** K. M. Gorbunova and P. D. Dankov. *Zhurnal Fizicheskoi Khimii,* v. 27, no. 11, Nov. 1953, p. 1725-1730.

Scaling was shown to depend on preliminary passivation in various media to which the metal was subjected. Diagrams, table, micrograph. 15 ref. (L16, Zn)

364-L. Production of Vitreous-Enamelled Iron Castings. A. Adam. *Foundry Trade Journal,* v. 96, Mar. 4, 1954, p. 249-254.

Investigates defect phenomena occurring during enameling. Objective is improved product, greater reliability and popularity of process. Photograph, graph. (L27, CI)

365-L. Apparent Density of Thin Evaporated Films. M. S. Blois, Jr., and L. M. Rieser, Jr. *Journal of Applied Physics,* v. 25, Mar. 1954, p. 338-340.

Measurements of copper and silver films formed by evaporation and manifestations of low apparent densities in physical experiments. Graphs, diagrams. 10 ref. (L25, P10, Cu, Ag)

366-L. The New Look in Galvanized Steel. Ernest W. Horvick. *Materials & Methods,* v. 39, Mar. 1954, p. 107-109.

Highly corrosion resistant, attractive and workable coating made possible by modern, controlled processing. Photographs. (L16, Zn, ST)

367-L. Surface Treatment and Finishing of Light Metals. I. Develop-

ment, Applications and Finishes. S. Wernick and R. Pinner. *Metal Finishing,* v. 52, Mar. 1954, p. 56-59, 69.

Properties and advantages of light metals with particular emphasis on aluminum and its alloys. (L general, Al, Mg)

368-L. A Radiometric Study of the Iron Phosphating Process. Stanley L. Eisler and Jodie Doss. *Metal Finishing,* v. 52, Mar. 1954, p. 60-63.

Amount of $FePO_4 \cdot 2H_2O$ contained in phosphate coatings prepared from solutions of H_3PO_4, NaH_2PO_4 and from commercial iron phosphating preparation determined radiometrically. Tables, photographs. 5 ref. (L14)

369-L. Electroless Nickel Barrel Plating. Harry J. West. *Metal Finishing,* v. 52, Mar. 1954, p. 64.

Commercial production, explaining and outlining exact procedure, type of equipment and formulas. (L14, Ni)

370-L. Emulsifiable Solvent Cleaning. B. J. Sherwood. *Metal Finishing,* v. 52, Mar. 1954, p. 70-72.

Operating characteristics and technical advantages of process. Composition and properties. Diagram. (L12)

371-L. Preparation and Selection of Felt Finishing Wheels. *Metal-Working,* v. 10, Apr. 1954, p. 20-21.

Guide for selecting proper speeds and wheel for specific jobs. Tables, drawings. (L10)

372-L. These Remarkable Epoxys. Charles A. Cerami. *Organic Finishing,* v. 15, Mar. 1954, p. 15-18, 23.

Combining epoxy group of resin finishes with phenolic or urea resins or fatty acids results in materials of great versatility. Photographs. (L26)

373-L. Custom-Finishing Busses and Trucks. Howard E. Jackson. *Organic Finishing,* v. 15, Mar. 1954, p. 19-23.

Cleaning and priming, spray painting and drying. Photographs. (L10, L11, L26)

374-L. Small Parts Finishing and Calculation of Finishing Costs. E. M. Yacko. *Organic Finishing,* v. 15, Mar. 1954, p. 24-26.

Choice of finishing method and cost factors in finishing operation. (L general)

375-L. Modern Coatings Add Service Life. *Steel,* v. 134, Mar. 15, 1954, p. 102-103.

In maintenance of buildings and structures, synthetic-binder paints and mastics offer top performance under most adverse corrosive conditions. Photographs. (L26)

376-L. Research on Electrodeposition in Great Britain. G. E. Gardam. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 1-13; disc., p. 13.

Review of type and magnitude of research effort. Detailed description of few important recent researches. (L17)

377-L. Electroplating Research in France. Jean Salauze. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 15-21; disc., p. 21-22.

Work involves use of perchloric acid in electropolishing. Table. 18 ref. (L13)

378-L. Electroplating Research in Germany, Belgium, and Holland. P. Baeyens. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 23-26.

Cheaper methods of obtaining brightness through use of bright-plating solutions, periodic reverse current and electrolytic polishing. (L17, L13)

379-L. Electrodeposition Research at the National Bureau of Standards. William Blum. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 27-28.

Nine projects under consideration by electrodeposition section. (L17)

380-L. Electrodeposition Research at Battelle Memorial Institute. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 29-34; disc., p. 34-35.

Includes "Introduction", C. L. Faust; "An Investigation of Electrodeposited Alloys and Pure Metals as Substitutes for Zinc and Cadmium for Protective Finishes for Steel Parts of Aircraft", A. B. Trippler, Jr.; "The Mechanism of Hydrogen Entry Into Metals", L. D. McGraw; and "Electroforming Aluminum", W. H. Safranek. (L17, L18)

381-L. Electrodeposition Research in Progress at Armour Research Foundation. William H. Colner. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 41-45; disc., p. 45-46.

Reasons and experiments for plating titanium. Silver plating of wave guides and deposition of magnetic nickel-cobalt alloy. Micrographs, graphs. (L17, Ti, Ag, Ni, Co)

382-L. Electrodeposition Research of Westinghouse Electric Corporation. George W. Jernstedt. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 47-50; disc., p. 50-52.

Laboratory procedure and operations. Leveling investigated in periodic reverse current (PR) method. (L17)

383-L. Brass Plating. K. G. Compton and R. A. Ehrhardt. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 53-54; disc., p. 55.

Brass-plating solutions producing deposits containing between 65 and 75% of copper, with a minimum variation of composition at current density for rubber adhesion. (L17, Cu)

384-L. Electroplating in the Sleeve-Bearing Industry. R. A. Schaefer. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 57-62; disc., p. 62-63.

Trimetal bearing construction and electroplated overlaps considered. Diagrams, table, graph, micrographs. 8 ref. (L17, T7)

385-L. Research at Enthone, Inc. on Metal Finishing. Walter R. Meyer. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 65-68; disc., p. 68.

Includes conversion coatings; blackening and coloring of metals; chemical displacement coatings; oxide coatings on metals; selective dissolution of metals; study of detergents, cleaning processes; pickling inhibitors, or methods pertaining to preparation of metals for electroplating; stripping of organic coatings; and study of electroplating solutions. (L general)

386-L. Determination of Impurities in Electroplating Baths. Earl J. Serfass. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 73-79.

Summary of approach to problem and results achieved. Tables. (L17)

387-L. Effects of Impurities in Plating Solutions. D. T. Ewing, John K. Werner and Arthur Brouwer. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 81-88; disc., p. 88-89.

Changes caused by single metallic impurities in physical properties of electrodeposited nickel from four types of nickel-plating solutions. Graphs, tables. 7 ref. (L17, Ni)

388-L. Porosity in Perspective. Nathaniel Thon. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 91-94.

Simple method and apparatus whereby gas permeability of electrodeposits can be measured and expressed numerically by a permeability constant. (L17)

389-L. Correlation of Gas Permeability of Electrodeposits With Their Weathering Behavior. Fielding Ogburn and Asaf Benderly. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 95-96; disc., p. 96-99.

Photographing gross porosity was employed instead of microscopic survey method. (L17, R2)

390-L. Properties of Electrodeposited Nickel. Abner Brenner. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 101-111; disc., p. 111-112.

Relations between physical properties, structure and composition of deposits. Graphs, photomicrographs, charts, radiographs.

(L17, Q general, P general, M27, Ni)

391-L. Current and Metal Distribution in Electrodeposition. John Kronsbein. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529. p. 121-124.

Correlates mathematical approach and experimental research for current distribution of various anode-cathode arrangements. Table, graphs. 3 ref. (L17)

392-L. The Use of Ceramic Coatings in Gas Turbine Combustion Chambers. F. G. Code Holland. Paper from "Selected Government Research Reports V. X. Ceramics and Glass" Her Majesty's Stationery Office, London, p. 1-7.

Benefits resulting from application of ceramic coatings. Reduction in flame tube temperature calculated to be of the order of 80° C. Table. 3 ref. (L27)

393-L. The Production and Uses of Tin Coatings. Frederick A. Lowenheim. Paper from "Symposium on Tin". ASTM Special Technical Publication no. 141. p. 25-37; disc., p. 37-40.

Properties, methods of application, problems and recent developments in tin and tin-alloy coatings. 32 ref. (L16, L17, Sn)

394-L. Trends in the Use of Tin in the Container Industry. R. R. Hartwell. Paper from "Symposium on Tin". ASTM Special Technical Publication no. 141. p. 41-49; disc., p. 50-51.

Properties of tin plate; tin consumption statistics; and effect of new materials and coating methods on consumption. Graphs, tables. 7 ref. (L16, L17, A4, Sn)

395-L. (German.) **Tin-Zinc Alloy Deposits.** Hermann Heinemann. *Metalloberfläche,* Edition B, v. 6, no. 3, Mar. 1954, p. 33-35.

Working specifications for proper electroplating of metals with tin-zinc alloy claimed to be superior to tin plating as a protection against rusting and in hardness and wear-resistance. (L17, Sn, Zn)

396-L. (German.) **Mechanical Surface Improvement (Grinding and Polishing) of Metals in England.** W. Edwards. *Metalloberfläche,* Edition B, v. 6, no. 3, Mar. 1954, p. 35-38.

Effect of design and preliminary treatment on quality of work. Nature of a polish and mechanical and electrical processes. Working conditions and use of holding devices. Diagrams. 5 ref. (L10, G18)

397-L. (German.) **Further Development of the Technique of Metal Spraying.** Hans Reininger. *Metalloberfläche,* Edition B, v. 6, no. 3, Mar. 1954, p. 39-42.

Advantages and disadvantages of different surfaces for better adherence. Structure and properties of layers as function of grain size and spraying conditions. Diagrams, table, micrographs, photographs. 17 ref. (L23)

398-L. (German.) **The Anodic Behavior of Aluminum and Al-Mg Alloys in Sulfuric Acid and Sodium Sulfate Solutions.** Willi Machu and M. Kamal Hussein. *Werkstoffe und Korrosion,* v. 5, no. 2, Feb. 1954, p. 49-54.

Only one cathodic polarization had slight effect on loosening of oxide film. Rapid passivation always follows this activation. Graphs. 8 ref. (L19, Al, Mg)

399-L. (German.) **Reaction Primers and Metal Painting.** Benno Elfisch. *Werkstoffe und Korrosion,* v. 5, no. 2, Feb. 1954, p. 54-56.

Methods of making reaction primers. Composition depends on nature and properties of metallic surface to be protected. 7 ref. (L26)

400-L. **Ceramic-Coated Metals for Industry.** Burnham W. King. *Battelle Technical Review,* v. 3, Apr. 1954, p. 39-42.

Chemical and mechanical properties of materials, nature of bond between ceramic coating and metal, protection afforded metal and industrial applications. Graph, drawing. (L27)

401-L. **Why Go to Thick Protective Coatings?** R. R. Pierce. *Chemical Engineering,* v. 61, Apr. 1954, p. 177-179, 181.

Experimental studies. Graphs. 3 ref. (L general)

402-L. **Epoxys for Cements & Coatings.** Raymond B. Seymour and Robert H. Steiner. *Chemical Engineering,* v. 61, Apr. 1954, p. 244 + 4 pages.

Resistance to chemical corrosion and physical properties. Charts. (L27)

403-L. **Cadmium for Plating Connectors.** D. C. Hubbard, R. W. Kunkle and A. B. Chance. *Electrical World,* v. 141, Mar. 29, 1954, p. 47-48, 50.

Fortified cadmium and hot-flowed electro-tin plate are desirable materials for plating connectors used in aluminum-to-copper connections. Micrographs, graphs, charts. (L17, Cd, Sn)

404-L. **Factors Affecting the Choice of Finish for Electrical Equipment.** E. C. J. Marsh. *Electroplating and Metal Finishing,* v. 7, Mar. 1954, p. 88-91.

Choice is influenced by function of finish, conditions under which it will be used, practicability of incorporating necessary finishing operations in total production sequence and cost of the finish selected. Tables, photographs. (To be continued.) (L general, T1)

405-L. **Electroplating of Powder Metal Compacts.** R. Rushbrook. *Electroplating and Metal Finishing,* v. 7, Mar. 1954, p. 92-96.

Difficulties involved in applying electroplated finishes are mainly those of removing cleaning or plating solutions entrapped in pores. Five techniques presented. Micrographs, photograph. 10 ref. (L17, H general, Fe, Cu)

406-L. **Adhesion and Surface Preparation in Protective Metal Spraying. II. The Effect of Blasting Conditions.** J. M. Cowan. *Electroplating and Metal Finishing,* v. 7; *Metal Spraying,* v. 4, Mar. 1954, p. 117, 119, 121-122.

Effect of grit-blasting conditions on adhesion, as well as effect of basis and coating metals and metal spraying conditions. Graphs, tables. 16 ref. (L23)

407-L. **Molecular Bonded Bimetallic Components.** *Engineer,* v. 197, Mar. 12, 1954, p. 387-389.

Principal applications of Al-Fin process. Specialized uses in general engineering and military fields. Table, graph, photographs. (L22, T general)

408-L. **New Methods for Finishing Powder Metal Parts.** Charles C. Cohn. *Iron Age,* v. 173, Apr. 1, 1954, p. 125-128.

Field-tested finishing techniques have improved to a point where plated powder metal parts are far superior in corrosion resistance to metal parts plated by standard methods. Table, photograph. (L17, H general)

409-L. **Current Density Distribution in Electroplating by Use of Models.** Gilbert Ford Kinney and John V. Festa. *Plating,* v. 41, Apr. 1954, p. 380-384.

Method of utilizing models in study of electric fields set up about irregular electrode in plating bath. Diagrams, graphs. 2 ref. (L17)

410-L. **Tentative Recommended Practice for Preparation of Copper and Copper-Base Alloys for Electroplating.** *Plating,* v. 41, Apr. 1954, p. 385-386, 391-393.

Tentative ASTM standard. 1 ref. (L17, S22, Cu)

411-L. **Metal Reflector Finishing.** E. B. Heyer. *Plating,* v. 41, Apr. 1954, p. 394-396.

Miscellaneous finishing operations that are performed on metal reflectors for motion picture projection-arc service. Photographs. (L general)

412-L. **A.E.S. Research Report: Project no. 12. Cleaning and Preparation of Metals for Electroplating. VIII. Effect of Oxide Films. A Survey of the Literature.** Henry B. Linford and Davis O. Feder. *Plating,* v. 41, Apr. 1954, p. 397-401.

Oxide film affects adhesion and microstructure of electroplate. Tables. 115 ref. (L17)

413-L. **New Angles for the Galvanizing Line. I.** D. A. McArthur, A. R. Geiszler and John Upton, Jr. *Steel,* v. 134, Apr. 5, 1954, p. 100-102.

Molten zinc is kept at operating temperature in a ceramic-lined pot that is heated by induction. Diagram, photographs. (L16)

414-L. **Cleaning Metal With Sonic Waves.** T. J. Kearney. *Steel,* v. 134, Apr. 5, 1954, p. 104-105.

Transducers convert electrical energy to ultrasonic energy which vibrates cleaning solution. Difficult soils in hard-to-get-at locations are readily removed. Photographs. (L10)

415-L. **The Applications of Blast Cleaning in Steel Processing. I.** Victor F. Stine. *Steel Processing,* v. 40, Mar. 1954, p. 159-163, 194.

Blast cleaning offers industry three basic advantages—speed, low cost and high quality of finish. Photographs. (L10, ST)

416-L. **Ultrasonics and Industrial Cleaning.** William L. McCracken. *Tool Engineer,* v. 32, Apr. 1954, p. 66-68.

Digest of "Ultrasonic Techniques in Industrial Cleaning", to be presented at the 22 Annual ASTE Meeting. Equipment, techniques and applications. Diagrams, photographs. (L10)

417-L. (Book.) **Selected Government Research Reports. v. X. Ceramics and Glass.** 148 p. 1952. Her Majesty's Stationery Office, Box 569, London S.E. 1, England. $5.75.

Reports on refractory coatings for metals, apparatus for determining mechanical and physical properties of ceramic materials, applications of ceramic bodies in heat engines, hot pressing zirconium carbide, fractures in glass, and the testing of glass optical flats. (L27, H general)

M

Metallography, Constitution and Primary Structures

130-M. **The Mechanism of Metallographic Etching. I. The Reaction Potentials of a Two-Phase Brass in Various Etching Reagents.** George L. Kehl and Max Metlay. *Electrochemical Society, Journal,* v. 101, Mar. 1954, p. 124-127.

Potentials generated by reaction of portions of small, single grains of each of the two phases of alpha-beta brass with various etching solutions were measured. Potential of beta phase is consistently 0.01 to 0.03 v. more anodic than that of the alpha phase in the same reagent. Micrographs, graph, table. 6 ref. (M21, Cu)

131-M. **Lattice Dynamics of Body-Centered and Face-Centered Cubic Metallic Elements.** Jules de Launay. *Journal of Chemical Physics,* v. 21, Nov. 1953, p. 1975-1986.

Lattice dynamics are modified to include the role which conduction electrons play in acoustical wave motion. This leads to relations connecting dynamic parameters with elastic constants and yields the Fuchs relations in an elementary manner. 18 ref. (M26)

132-M. **Phases in Titanium Alloys Identified by Cumulative Etching.** Elmars Ence and Harold Margolin. *Journal of Metals,* v. 6, Mar. 1954, p. 346-348.

Techniques and advantages of process for use in phase diagram work. Diagram, micrograms, tables. 5 ref. (M21, M24, Ti, Mn, Fe)

133-M. **Occurrence of Silicon Carbide in the Fe-C-Si System.** James C. Fulton and John Chipman. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 356-357.

Data on phase relations. Table, micrographs. 2 ref. (M24, Fe)

134-M. **Constitution and Mechanical Properties of Titanium-Hydrogen Alloys.** G. A. Lenning, C. M. Craighead and R. I. Jaffee. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 367-376.

Hydrogen has little effect on tensile properties but decreases notch-bar toughness to a large degree. This latter effect appears to be result of increased notch sensitivity. Tables, micrographs, graphs. 11 ref. (M24, Q23, Ti)

135-M. **Dislocations in Plastically Deformed Germanium.** G. L. Pearson, W. T. Read, Jr., and F. J.

Morin. *Physical Review,* v. 93, ser. 2, Feb. 15, 1954, p. 666-667.

Both *n*- and *p*-type germanium rods were deformed by bending. Hall effect, conductivity and lifetime were measured on both control and deformed samples. Graphs, micrograph. 5 ref. (M26, P15, Ge)

136-M. (Czech.) **Metallography of Tin, Tin Alloys, and Tin Coating on Steel.** Josef Teindl. *Hutnické Listy,* v. 9, no. 2, Feb. 1954, p. 95-98.

New ways of cleaning, coating, polishing and etching. Different methods for metallographic research of tin layers on steel. Micrographs, diagrams. 14 ref.
(M21, M27, L general, Sn, ST)

137-M. (French.) **The Sigma Phase in Stainless Steels and Refractories and Its Practical Interest.** Gilles Pomey. *Métallurgie et la construction mécanique,* v. 86, no. 2, Feb. 1954, p. 99-101, 103, 105-106.

General properties of the sigma phase. Outlines numerous investigations on its formation and influence on properties of steels. Diagrams, graphs, micrographs. 19 ref.
(M26, SS)

138-M. (German.) **Metallographic Photomicrography on Small Negatives.** K. Diebold. *Acta Technica Academiae Scientiarum Hungaricae,* v. 7, nos. 3-4, 1953, p. 341-357.

Reviews apparatus, materials, and methods. Small film projectors that can be used as illuminating equipment. Methods of increasing illuminating power of enlarging apparatus. Photographs, micrographs. (M21)

139-M. (German.) **Quick Polishing of Metallographic Microsections From Cast Iron.** Erling Juul Nielsen. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 89-92.

Sections with nonmetallic inclusions are polished first electrolytically and then mechanically. Micrographs, diagram. 14 ref. (M21, CI)

140-M. (German.) **History and State of Composition Research.** H. Spengler. *Metall,* v. 8, nos. 3-4, Feb. 1954, p. 107-115.

Survey of binary systems of metals and metalloids. Extensive bibliography in alphabetical order of metals and alloys involved. Tables. 4 ref. (M24)

141-M. (German.) **Metallographic Means of Observing and Determining the Orientation of Crystals.** Margarete Schippers. *Umschau in Wissenschaft und Technik,* v. 54, no. 4, Feb. 15, 1954, p. 111-114.

Recently developed methods for aluminum and its alloys. Micrographs. 7 ref. (M26, Al)

142-M. (German.) **The Electron-Microscopic Investigation of Metal Surfaces With the Aid of Vapor-Deposited Silicon Monoxide Replicas.** Heinz Wilsdorf. *Zeitschrift für Metallkunde,* v. 45, no. 1, Jan. 1954, p. 14-22.

Preparation of replicas, practical applications with resolutions up to 36 Å, and first successful electron microscopic recording of an oxide-free metal surface by replica process. Photographs, micrographs, graphs. 40 ref. (M21, Ag, Cu)

143-M. (German.) **The Alloys of Platinum Metals With Molybdenum.** Ernst Raub. *Zeitschrift für Metallkunde,* v. 45, no. 1, Jan. 1954, p. 23-30.

Results of X-ray and metallographic investigations and hardness measurements of alloys of molybdenum with rhodium, ruthenium, palladium, osmium, indium and platinum. Tables, graphs, photomicrographs. 2 ref. (M24, Q29, Mo, Rh, Ru, Pd, Os, In, Pt)

144-M. (German.) **Reactions of Several Magnesium Alloys With Cast-Iron Melts.** Ulrich Zwicker. *Zeitschrift für Metallkunde,* v. 45, no. 1, Jan. 1954, p. 31-35.

Studies of effect of key-alloy components on metallographic structure of cast iron. Micrographs, graph.
(M27, Mg, Si, CI)

145-M. (German.) **Electron Microscopic Dark Field Image as a Means of Identifying Small Crystals.** Otto Rang and Fritz Schleich. *Zeitschrift für Physik,* v. 136, no. 5, 1954, p. 547-555.

Investigates structure of individual crystals in a solid solution and possibility of determining their chemical composition. Examples. Diagrams, micrographs. 10 ref.
(M26, M21)

146-M. (Hungarian.) **Metallographic Microphotography on Narrow Film. II.** Karoly Diebold. *Ontöde,* v. 5, no. 2, Feb. 1954, p. 33-40.

Practical suggestions for economical and successful processes, methods and equipment. Special equipment constructed by author. Photographs, micrographs. (M21)

147-M. **Recent Developments in Electron Microscopy.** Joseph J. Comer. *Mineral Industries,* v. 23, no. 6, Mar. 1954, p. 1, 3-5, 8.

Includes micrographs. 9 ref.
(M21)

148-M. **Changes in the Lattice Parameter of Polycrystalline Solid Solutions and Intercrystalline Internal Adsorption.** V. I. Arkharov and N. N. Skornyakov. *National Science Foundation Translation, no.* 96, Oct. 1953, 5 p. (From *Doklady Akademii Nauk SSSR,* v. 89, 1953, p. 841-844.)

Introducing antimony into a copper-base alloy markedly increased lattice parameter of copper, beryllium decreased it, iron caused no perceptible change. Table. 7 ref.
(M26, Cu, Sb)

149-M. **On the Possible Development of the Theory of Dislocations.** V. I. Arkharov, G. N. Kolesnikov and A. N. Orlov. *National Science Foundation Translation, no.* 212, Feb. 1954, 4 p. (From *Doklady Akademii Nauk SSSR,* v. 92, no. 4, Oct. 1, 1953, p. 751-754.)

Previously abstracted from original. See item 122-M, 1954. (M26)

150-M. **Cohesion of the Alkali Metals in the Thomas-Fermi-Dirac Theory.** N. H. March. *Philosophical Magazine,* v. 45, 7th ser., no. 362, Mar. 1954, p. 325-328.

Thomas-Fermi-Dirac method affords some explanation of metallic binding. Results predicted by theory. 10 ref. (M25, EG-e)

151-M. **The Anomalous Spin of "Ti.** B. H. Flowers. *Philosophical Magazine,* v. 45, 7th ser., no. 362, Mar. 1954, p. 329-332.

Spin is understood on basis of independent particle model provided proper account is taken of charge independence of nuclear forces. 13 ref. (M25, Ti)

152-M. **Relation of Microstructure to High-Temperature Properties of a Wrought Cobalt-Base Alloy, Stellite 21 (AMS 5385).** F. J. Clauss and J. W. Weeton. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3108, Mar. 1954, 49 p.

Microstructure of wrought Stellite 21 responds readily to solution treatment and to isothermal and aging heat treatments to form pearlitic and Widmanstätten structures as well as scattered precipitate. Graphs, micrographs, diagram, table. 7 ref.
(M27, Q general, Co)

153-M. **An Investigation of Lamellar Structures and Minor Phases in Eleven Cobalt-Base Alloys Before and After Heat Treatment.** J. W. Weeton and R. A. Signorelli. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3109, Mar. 1954, 50 p.

Metallographic and X-ray diffraction studies. Tables, graphs, micrographs. 16 ref.
(M26, M27, Co, Cr, Ni, Mo, W, Cb, Fe)

154-M. **Principal Types of Phase Diagrams for Titanium-Base Binary Systems.** I. I. Kornilov. *Henry Brutcher, Altadena, Calif., Translation no.* 3201, 7 p. (From *Doklady Akademii Nauk SSSR,* v. 91, no. 3, July 21, 1953, p. 549-551.)

Previously abstracted from original. See item 26-M, 1954. (M24, Ti)

155-M. **Optical Microscopy.** George L. Kehl. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 1-32.

Phase contrast microscopy and reflecting-type objective. Micrographs, diagrams. 55 ref. (M21)

156-M. **Field Emission Microscopy.** Erwin W. Müller. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 33-50.

Instrument produces magnifications of 500,000 times. Due to unique current density of field emission, pictures are bright enough to be photographed with motion picture camera at ordinary frame speed or to be projected on a large screen in an auditorium. Diagrams, micrographs. 9 ref. (M21)

157-M. **Electron Diffraction and Microscopy of Metals.** R. D. Heidenreich. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 51-71.

Reviews techniques and methods of examining metal surfaces by electron diffraction and electron microscopy. Diagram, graph, electron diffraction patterns. 19 ref.
(M22, M21)

158-M. **X-Ray Diffraction Techniques.** Charles S. Barrett. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 72-94.

Considers high intensity and high brilliance X-ray tubes, monochromators and various types of counting tubes for intensity measurement. Oscillogram, diagrams, microradiograph. 55 ref. (M22)

159-M. **The Diffuse Scattering of X-Rays.** B. E. Warren and B. L. Averbach. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 95-130.

Scattering in a metal or alloy with cubic structure for disorder data. Diagrams, graphs, tables. 22 ref. (M22)

160-M. **Crystal Orientation and Pole Figure Determination.** A. H. Geisler. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 131-153.

Studies of mechanical and physical properties, deformation, recrystallization, grain growth, solid-state transformations, corrosion rates and diffusion frequently involve crystal orientation determination. Photographs, diagrams, graphs. 34 ref.
(M23)

161-M. **Techniques and Applications of Neutron Diffraction.** C. G. Shull. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 154-169.

Compares neutron, X-ray and electron diffraction techniques. Usefulness of neutron techniques by series of applications. Table, graphs, diagrams, photograph. 11 ref. (M22)

162-M. **Ferromagnetic Domains.** H. J. Williams. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 251-277.

Magnetic domain structures can be observed and changes in structures can be followed as an applied magnetic field is varied. Effect of stress can also be observed. Diagrams, micrographs, graph. 23 ref. (M27, P16)

163-M. **Radioactive Tracers in Physical Metallurgy Research.** Michael B. Bever. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 278-311.

Reviews fundamentals of radioactivity and presents tracer techniques suitable for metallurgical research. Micrographs. 157 ref. (M23)

164-M. **Radiation Damage as a Metallurgical Research Technique.** Sidney Siegel. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 312-324; disc., p. 325.

Copper, order-disorder alloys and precipitation hardening alloys referred to in use of this method. Diagram, graphs, table. 16 ref. (M23, Cu)

165-M. (French.) **Ultra-Rapid Micrographic Examination of Copper and Its Alloys.** P. A. Jacquet. *Cuivre Laitons, Alliages,* 1953, no. 16, Nov.-Dec., p. 49-55.

Microstructure of all common copper-base materials can be revealed with an automatic polishing apparatus. Method permits shop control of production. Photograph, table, micrographs. 6 ref. (M21, Cu)

166-M. (German.) **Investigation of Electrolytic Condenser Foils.** L. Holik and H. Nowotny. *Metall,* v. 8, nos. 5-6, Mar. 1954, p. 180-184.

Evaluation of experiments on etching of aluminum foils for X-ray and metallographic examination. Graphs, tables, micrographs, photographs. 7 ref. (M21, Al)

167-M. **Progress of the Physics of Solids.** Frederick Seitz. *Applied Mechanics Reviews,* v. 7, Apr. 1954, p. 137-138.

Imperfection-determined properties of crystals can be understood in terms of six primary imperfections. (M26)

168-M. **Investigation of the Degree of Perfection of a Crystal by Means of Polarized X-Rays.** S. Ramaseshan and G. N. Ramachandran. *Indian Academy of Sciences, Proceedings,* v. 39, sec. A, Jan. 1954, p. 20-30.

Investigates intensity of Bragg reflection when incident X-rays are polarized and azimuth of electric vector is varied with respect to plane of reflection. Tables, graphs, diagrams. 11 ref. (M26, M22)

169-M. **A Simple Method for the Precision Measurement of Lattice-Constants.** H. J. Goldschmidt. *Journal of Scientific Instruments,* v. 31, Mar. 1954, p. 82-83.

Instrument for accurate measurement of lattice-spacings on X-ray powder photographs simulates geometric conditions existing on camera while pattern is obtained. Diagram. 4 ref. (M26, M22)

170-M. **An Electron Diffraction Apparatus With a New Electron Optical System Designed for the Examination of Surface Structure.** C. S. Lees. *Journal of Scientific Instruments,* v. 31, Mar. 1954, p. 84-86.

Apparatus and operating characteristics. Diagrams. 6 ref. (M22)

171-M. **Some Relations for Crystals With Substructures.** M. J. Buerger. *National Academy of Sciences of the United States of America, Proceedings,* v. 40, Feb. 1954, p. 125-128.

Presence of substructure gives rise to specialized X-ray diffraction effects. Patterson map and reciprocal lattice have specialized features which may be recognized. Diagrams. 6 ref. (M22, M26)

172-M. (Russian.) **X-Ray Investigation of Alloys in the System Aluminum-Palladium.** Iu. P. Simanov. *Zhurnal Fizicheskoi Khimii,* v. 27, no. 10, Oct. 1953, p. 1503-1509.

Test specimens prepared from fine filings pressed into cylinders. Tables. 6 ref. (M24, Al, Pd)

173-M. (Book.) **Electron Optics.** O. Klemperer. 2nd Ed. Cambridge Monographs on Physics. 471 p. 1953. Cambridge University Press, Cambridge, England. $9.50.

Principles, methods, and applications. Covers lenses, emission systems, deflecting fields, and uses of electron microscopy in research and industry. (M21, M22)

174-M. (Book.) **Manual of the Polarizing Microscope.** A. F. Hallimond. 204 p. 1953. Cooke, Troughton & Simms, Ltd., York, England. 15/.

Designed as guide for use of Cooke microscopes. Description of design and accessories. (M21)

N

Transformations and Resulting Structures

131-N. **Segregated Graphite in Steel.** J. J. Kanter. *American Petroleum Institute, Proceedings,* sec. III, v. 33, 1953, p. 225-229; disc., p. 245-252.

Causes and remedies of graphitization problems. 1 ref. (N8)

132-N. **The Effect of Compression and of Hydrostatic Pressure on the Diffusion Anisotropy in Zinc.** T. Liu and H. G. Drickamer. *Journal of Chemical Physics,* v. 22, Feb. 1954, p. 312-319.

Measurements made on rate of self diffusion in single crystals along directions both parallel and perpendicular to the *C* axis. Graphs, diagrams, tables. 13 ref. (N1, Zn)

133-N. **On the Mechanism of Grain Growth in Metals, With Special Reference to Steel.** D. G. Cole, P. Feltham and E. Gillam. *Physical Society, Proceedings,* v. 67, no. 410B, Feb. 1954, p. 131-137.

Rate of grain growth in initial stages of isothermal austenitizing studied by thermal etching method in plain, eutectoid carbon steel in range 840 to 970° C. Graphs, micrographs. 24 ref. (N3, CN)

134-N. **Orientation of Cementite in Tempered Carbon Steel.** I. V. Isaichev. *Henry Brutcher, Altadena, Calif., Translation no.* 3213, 8 p. (From *Zhurnal Tekhnicheskoi Fiziki,* v. 17, no. 7, 1947, p. 835-838.)

Previously abstracted from original. See item 4-188, 1947. (N5, CN)

135-N. (English.) **Factors Influencing the Isothermal Transformation of Austenite in the Intermediate Range (Bainite Range).** Otto Schaaber. *Draht (English Ed.),* 1954, no. 19, Feb., p. 19-25.

Fundamental features of the isothermal transformation of austenite. Graphs, photograph, tables. (To be continued.) (N8, ST)

136-N. (Czech.) **Examining Structural Changes in Connection With Secondary Hardening of Low-Alloy Boiler Steel by Electronographic Method.** Frantisek Kralik. *Hutnické Listy,* v. 9, no. 2, Feb. 1954, p. 77-83.

Precipitation of alloy carbides at temperatures between 450 and 700° C. considered as primary cause for secondary hardening. Tables, micrographs, photographs, graph. 4 ref. (N7, AY, Mo, V)

137-N. (French.) **Effect of Impurities on Allotropic Transformation of Cobalt and Its Alloys.** Jacques Pomey and René Lucien Le Roux. *Comptes rendus,* v. 238, no. 7, Feb. 15, 1954, p. 814-815.

Importance of carbon, nitrogen, iron and hydrogen in transformation from alpha to beta phase. Large quantities of impurities are necessary for stability in beta phase. (N6, Co)

138-N. (French.) **Influence of Cold Working After Tempering on Phases in Copper-Aluminum Alloys Containing 4% Copper.** Rene Graf and Andre Guinier. *Comptes rendus,* v. 238, no. 7, Feb. 15, 1954, p. 819-821.

X-ray study of polycrystalline specimen shows that cold working speeds up formation of theta prime and theta precipitates. Table. 3 ref. (N6, N7, Al)

139-N. (French.) **Practical Effects of the Grain and Texture in Nonferrous Metals.** Jean Hérenguel. *Métaux, Corrosion-Industries,* v. 29, no. 341, Jan. 1954, p. 1-13.

Formation of texture during solidification and its effect on mechanical properties and recrystallization. Micrographs, table, diagrams, photographs. 9 ref. (N12, N5, Q general, Al, Mg, Zn)

140-N. (French.) **A Method of Calculating Grains and Its Applications.** W. Dickenscheid. *Métaux, Corrosion-Industries,* v. 29, no. 341, Jan. 1954, p. 14-23.

Method for measuring distribution of crystals. Example of application to isothermal recrystallization as a function of time, temperature and gamma-alpha transformation. Tables, graphs. (N5, M27, Al)

141-N. (German.) **Investigation of Nickel-Carbon Alloys and Cast Iron.** Erich Scheil. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 71-76.

Shows that graphite of these alloys crystallizes directly, not through decomposition of carbide. Graphs, micrographs. 24 ref. (N12, N8, Ni, CI)

142-N. (German.) **The Mechanism of Crystal Growth Far From the Phase Equilibrium.** Ludwig Graf. *Zeitschrift für Metallkunde,* v. 45, no. 1, Jan. 1954, p. 36-47.

Rapid crystal growth is a kinetics process. Formation of dendrites in rapidly cooling melts is a normal phenomenon of rapid growth conditions as a manifestation of kinetic equilibrium. Photographs, micrographs. 67 ref. (N12, Cu, Al, Ag, Fe, Cd, Zn)

143-N. **An Investigation on the Isothermal Transformation of an Aluminium Bronze.** E. G. Ramachandran and A. Subramanya Iyer. *Indian Institute of Science, Journal,* v. 36, sec. A, Jan. 1954, p. 14-19 + 2 plates.

Transformation of beta-phase studied microscopically and from hardness data at constant temperatures from 350 to 560° C. Table, graphs. 3 ref. (N6, Cu)

144-N. **Effect of Hydrogen on the Continuous-Cooling Transformation Diagram for a Manganese-Molybdenum Steel.** C. L. M. Cottrell. *Iron and Steel Institute, Journal,* v. 176, Mar. 1954, p. 273-282 + 1 plate.

Diagrams cover range of cooling rates occurring during normal arc-welding process and were observed for steel both with and without supersaturation with hydrogen. Prob-

able effects of hydrogen on hard-zone cracking. Tables, diagram, graphs, micrographs. 19 ref. (N8, K1, AY)

145-N. Radiation Damage Effects on Order-Disorder in Nickel-Manganese Alloys. Lewis R. Aronin. *Journal of Applied Physics,* v. 25, Mar. 1954, p. 344-349.

Fast neutron irradiation in nuclear reactor on order-disorder series of nickel-manganese alloys ranging from 16.5 to 31.9 atomic-% manganese studied by resistivity and magnetic induction measurements. Graphs. 16 ref. (N10, Ni, Mn)

146-N. Diffusion of Gold Into Copper. A. B. Martin, R. D. Johnson and Frank Asaro. *Journal of Applied Physics,* v. 25, Mar. 1954, p. 364-369.

Radioactive tracer techniques utilized to measure rate of diffusion over temperature range from 1000 to 375° C. Graphs, tables. 19 ref. (N1, Cu, Au)

147-N. The Nonsteady Rate of Nucleation of a New Phase Under Great Supercooling. B. Ya. Lyubov. *National Science Foundation Translation, no.* 109, Nov. 1953, 4 p. (From *Doklady Akademii Nauk SSSR,* v. 91, 1953, p. 245-248.)

Experiments show high-temperature phase may be preserved at low temperatures for a long time in a metastable state. Graph. 3 ref. (N2)

148-N. On Local Distortions of the Crystal Lattices of Alloys During Transformation Hardening. L. Moroz and T. Mingin. *National Science Foundation Translation, no.* 99, Oct. 1953, 3 p. (From *Doklady Akademii Nauk SSSR,* v. 91, no. 2, July 11, 1953, p. 249-251.)

Previously abstracted from original. See item 14-N, 1954. (N6, M26, Fe)

149-N. Further Studies of the Mechanism by Which Hydrogen Enters Metals During Chemical and Electrochemical Processing. L. D. McGraw, W. E. Ditmars, C. A. Snavely and C. L. Faust. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3164, Mar. 1954, 37 p.

Current work shows entry of hydrogen into metals occurs when hydrogen-metal alloy formation is simultaneous with discharge of hydrogen atoms. Graphs, diagrams, tables. 17 ref. (N1, ST, Fe)

150-N. Crystal Growth and Crystal Boundary Techniques. Bruce Chalmers. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 170-183; disc., p. 184-185.

Methods for preparation of single crystals include growth from vapor and solution, solidification of a melt and re-arrangement of atoms in solid state. Diagrams. 19 ref. (N12)

151-N. Reaction of Nitrogen With, and the Diffusion of Nitrogen in, Thorium. A. F. Gerds and M. W. Mallett. *Electrochemical Society, Journal,* v. 101, Apr. 1954, p. 175-180.

Rates of reaction of nitrogen with thorium determined for temperature range 670 to 1490° C. at atmospheric pressure. Rates of diffusion of nitrogen in thorium obtained over the temperature range 845 to 1490° C. at atmospheric pressure. Micrograph, graphs, tables. 13 ref. (N1, Th)

152-N. Adsorption Studies on Metals. III. The Sorption of Water Vapor on Nickel, Steel and Molybdenum. A. C. Zettlemoyer and J. J. Chessick. *Journal of Physical Chemistry,* v. 58, Mar. 1954, p. 242-245.

Study of oxide films present on surfaces of nickel, steel and molybdenum using both gas adsorption and calorimetric techniques. Graph, tables. 7 ref. (N15, Ni, ST, Mo)

P

Physical Properties and Test Methods

169-P. Magnetic Permeability of So-Called "Non-Magnetic" Metallic Materials. M. R. Gross. *American Society of Naval Engineers, Journal,* v. 66, Feb. 1954, p. 215-245.

Many "nonmagnetic" materials exhibit feeble but measurable magnetic properties such as permeability, coercive force and residual induction. Graphs, table, diagrams, photographs. 5 ref. (P16)

170-P. The Heat of Sublimation of Tin and the Dissociation Energy of SnO. Leo Brewer and Richard F. Porter. *Journal of Chemical Physics,* v. 21, Nov. 1953, p. 2012-2013.

Value for tin combined with heat of formation of gaseous tin oxide agrees with Birge-Sponer extrapolation to ground-state atoms. Tables. 11 ref. (P12, Sn)

171-P. The Vibrational Spectrum and the Specific Heat of Germanium and Silicon. Yü-Chang Hsieh. *Journal of Chemical Physics,* v. 22, Feb. 1954, p. 306-311.

Substances with diamond structure such as diamond, germanium, silicon and gray tin show that variations of the Debye characteristic temperature can be very large. Tables, graphs. 15 ref. (P12, Ge, Si)

172-P. Electrical Properties of N-Type Germanium. P. P. Debye and E. M. Conwell. *Physical Review,* v. 93, ser. 2, Feb. 15, 1954, p. 693-706.

Measurements of conductivity and Hall effect from 11 to 300° K on samples covering range from intrinsic to degenerate. Graphs, table. 26 ref. (P15, Ge)

173-P. Structural Defects in Copper and the Electrical Resistivity Minimum. T. H. Blewitt, R. R. Coltman, Jr., and J. K. Redman. *Physical Review,* v. 93, ser. 2, Feb. 15, 1954, p. 891.

Role of structural defects, especially grain boundaries, in resistivity minimum found in copper. Table. 4 ref. (P15, M27, Cu)

174-P. Absorption Cross Sections for 134 MeV Protons. J. M. Cassels and J. D. Lawson. *Physical Society, Proceedings,* v. 67, no. 410A, Feb. 1954, p. 125-133.

Absorption cross sections of carbon, aluminum, copper, cadmium and lead measured by a transmission method. Graphs, table, diagram. 30 ref. (P10, Al, Cu, Cd, Pb)

175-P. The Thermal Conductivity of Monovalent Metals. P. G. Klemens. *Physical Society, Proceedings,* v. 67, no. 410A, Feb. 1954, p. 194-196.

Two solutions of integral equation for Bloch's theory of thermal conductivity. 11 ref. (P11)

176-P. Effect of Magnetic Field on the Precipitation of Ferromagnetic Phase. Syohei Miyahara and Tadayasu Mitui. *Hokkaido University, Faculty of Science, Journal, ser. II.* v. 41, Nov. 1953, p. 275-286.

Behavior of ferromagnetic precipitates in nonferromagnetic phase and mechanism of heat treatment in magnetic field (i. e., so-called field cooling). Micrograph, graphs, diagram. 6 ref. (P16, Cu, Co)

177-P. (English.) **Measurements on the Electrical Resistivity of Thin Nickel Films at Very Low Temperatures.** A. Van Itterbeek, L. De Greve, L. Van Gerven and K. Sabbe. *Physica,* v. 20, no. 1, Jan. 1954, p. 1-6.

Resistance was very sensitive to temperature and measuring current. Hysteresis demonstrated. Graphs, tables. 8 ref. (P15, Ni)

178-P. (French.) **The Photomagnetic-Electric Effect on Germanium.** Hubert Bulliard. *Annales de physique,* v. 9, 12 me Serie, Jan.-Feb. 1954, p. 52-83.

Studies on action of light, diffusion and recombination. Action of magnetic field. Diagrams, graphs. 9 ref. (P16, P17, Ge)

179-P. (German.) **Causes for Deviations of the Magnetizing Processes From Raleigh's Law in the Case of Low Field Intensities.** Günther Sorger. *Frequenz,* v. 8, no. 2, Feb. 1954, p. 41-47.

Interpretation of deviations observed in soft silicon-iron plate. Agreement of hypothesis with measurements of dependence of permeability and shape of hysteresis loop upon field intensity. Graphs, table. 14 ref. (P16, AY)

180-P. (Russian.) **Electrical Resistance and Transparency of Films of Mg-Sb, Mg-Bi, and Mg-Sn Alloys.** G. A. Kurov. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 207-208.

Investigates vapor-deposited films on glass plates of various dimensions. Film thicknesses varied up to 40 microns. Deposition was at a pressure of 10^{-5} mm. of mercury. (P15, P17, Sb, Sn, Bi, Mg)

181-P. (Russian.) **Action of a Constant Electric Field on a Suspension of Metals and Semiconductors in Liquid Dielectrics.** L. G. Gindin, I. N. Putilova and L. M. Moroz. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 277-279.

Behavior of suspensions of platinum and copper powders and certain semiconductors. Diagram. 4 ref. (P15, Pt, Cu)

182-P. (Russian.) **Experimental Investigation of Surface Tension of Sodium Amalgams.** P. P. Pugachevich and O. A. Timofeevicheva. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 285-287.

Experimental investigations of surface tension of 56 sodium amalgams containing from 8×10^{-5} to 0.284 at. % of sodium. Measurements were performed at 22° C. under high vacuum. Graphs. 10 ref. (P10, Na, Hg)

183-P. On a Nonlinear Diffusion Equation Applied to the Magnetization of Saturable Reactors. Shou-Hsien Chow. *Journal of Applied Physics,* v. 25, Mar. 1954, p. 377-381.

Solution for cases of finite and infinite slabs of ferromagnetic material. Graphs. 2 ref. (P16, N1)

184-P. Heat Transfer Measurements at Sodium-Stainless Steel Interface. James W. Moyer and William A. Riemen. *Journal of Applied Physics,* v. 25, Mar. 1954, p. 400-402.

Experiments measure heat-transfer coefficient at a sodium-stainless steel (Type 347) interface. Diagrams. (P11, Na, SS)

185-P. Theory of Displacement of Domain Boundaries. N. S. Akulov and G. S. Krinchik. *National Science Foundation Translation, no.* 106, Nov. 1953, 4 p. (From *Doklady Akademii Nauk SSSR,* v. 89, 1953, p. 809-812.)

Displacement in ferromagnet under simultaneous action of external magnetic field and opposing fields. 7 ref. (P16)

186-P. On the Theory of Electrical Conductivity of Ferromagnetic Metals at Low Temperatures. A. I. Rezanov. *National Science Foundation Translation, no.* 206, Feb. 1954, 3 p. (From *Doklady Akademii Nauk SSSR,* v. 92, no. 5, Oct. 11, 1953, p. 935-937.)

Previously abstracted from original. See item 156-P, 1954. (P15)

187-P. Appearance Measurements. Reflectance. E. S. Beck. *Organic Finishing,* v. 15, Mar. 1954, p. 9-14.

Various instruments for measuring and evaluating reflectance. Diagrams, graphs, photograph. (To be continued.) (P17)

188-P. Magnetic Behaviour of Thin Single-Crystal Nickel Films. L. E. Collins and O. S. Heavens. *Philosophical Magazine,* v. 45, 7th ser., no. 362, Mar. 1954, p. 283-289 + 1 plate.

Coercivity of monocrystalline films grown epitaxially on (100) face of rock salt studied as function of thickness over range 200 to 1000 Å. Graphs. 9 ref. (P16, Ni)

189-P. Thermal Conductance of Contacts in Aircraft Joints. Martin E. Barzelay, Kin Nee Tong and George Hollo. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3167, Mar. 1954, 47 p.

Factors influencing thermal conductance across interface between aluminum alloy and stainless steel structural joints. Graphs, diagrams, tables, photographs. 9 ref. (P11, Al, SS)

190-P. (French.) **Thermo-Electric Properties of Bismuth.** Jean Savornin and André Poggi. *Comptes rendus,* v. 238, no. 6, Feb. 8, 1954, p. 656-657.

Systematic measurements made of thermoelectric power of bismuth associated with copper. Graphs. (P15, Bi, Cu)

191-P. (French.) **Influence of Very Low Impurity Content on Electric Conductivity of Refined Aluminum at Very Low Temperatures.** Michel Caron, Philippe Albert and Georges Chaudron. *Comptes rendus,* v. 238, no. 6, Feb. 8, 1954, p. 686-688.

Measurements made on specimens of 99.95 to 99.998% purity at temperatures ranging from 2.2 to 80° K. Shows stronger effect on samples with highest purity. Graphs, table. (P15, Al)

192-P. (German.) **The Magnetization in Iron-Silicon Crystals.** Bruno Elschner. *Annalen der Physik,* v. 13, nos. 6-8, Dec. 15, 1953, p. 290-304.

Elementary magnetic zones in vicinity of grain boundaries and natural and artificially introduced impurities. Diagrams, micrographs. 17 ref. (P16, Fe, Si)

193-P. (German.) **Local Tendency of Change of Solution Pressure of Metals Under Slight Stresses.** Paul Koch. *Metalloberfläche,* Edition A, v. 8, no. 3, Mar. 1954, p. 37-41.

Metallographic, magnetic and ultrasonic investigation of elastic and plastic deformations on thin microtensile specimens. Change in potential with stress applied in one of two steel springs immersed in an electrolyte. Diagrams, graphs, micrographs. (To be continued.) (P13, ST)

194-P. (German.) **Expansion of Spin-Wave Theory of Ferromagnetism to Higher Temperatures.** G. Heber. *Zeitschrift für Naturforschung,* v. 9a, no. 2, Feb. 1954, p. 91-97.

Elimination of several approximation assumptions results in improvements in statistical evaluation of energy spectrum and better temperature dependence. Graphs. 5 ref. (P16)

195-P. (German.) **Transverse Electromagnetic Effects in Semiconductors.** J. Appel. *Zeitschrift für Naturforschung,* v. 9a, no. 2, Feb. 1954, p. 167-174.

Theoretical investigation of effects with mixed impulse time and for two-band model on conductivity, resistance and Hall constants. Graphs. 7 ref. (P15, P16, Ge)

196-P. (Italian.) **The Solution of Metal Monocrystals in Acids. Determinations on Aluminum, Lead, and Zinc.** Giampaolo Bolognesi. *Metallurgia italiana,* v. 46, no. 1, Jan. 1954, p. 9-12.

Importance where surface reactivity is essential. Use in electrochemical surface reproduction. Photographs, graph. 8 ref. (P13, P15, Al, Pb, Zn)

197-P. An Ionization Manometer and Control Unit for Extremely Low Pressures. P. A. Redhead and L. R. McNarry. *Canadian Journal of Physics,* v. 32, Apr. 1954, p. 267-274.

Bayard-Alpert type ionization manometer for measurement of pressures as low as 10^{-10} mm. of mercury. Methods for increasing sensitivity. Diagrams, graphs. 4 ref. (P12)

198-P. Surface Reaction Between Oxygen and Thorium. A. F. Gerds and M. W. Mallett. *Electrochemical Society, Journal,* v. 101, Apr. 154, p. 171-174.

Rate of reaction of oxygen with arc-melted and rolled iodide thorium has been found to obey parabolic rate law in temperature range 850 to 1415° C. at one atmosphere pressure. Diagram, graphs, table. 13 ref. (P13, Th)

199-P. The Melting of Gallium. J. Jach and F. Sebba. *Faraday Society, Transactions,* v. 50, Mar. 1954, p. 226-231.

Differential thermal analysis and very slow heating rate shows that gallium does not have a sharp melting point. Graphs. 6 ref. (P12, Ga)

200-P. Magnetic Susceptibilities of Np^{+6}, Np^{+5}, and Np^{+4}. Dieter M. Gruen and Clyde A. Hutchison, Jr. *Journal of Chemical Physics,* v. 22, Mar. 1954, p. 386-393.

Susceptibilities of ions compared with those calculated for ions in electronic states of *f*-electron configurations in presence of electric fields of specific forms and with various amounts of spin-orbit coupling. Table, graphs. 23 ref. (P16, Np)

201-P. Electronic Structure, Infrared Absorption, and Hall Effect in Tellurium. Herbert B. Callen. *Journal of Chemical Physics,* v. 22, Mar. 1954, p. 518-522.

Analysis of band structure of tellurium based on symmetry properties of a drastically simplified model of its crystal structure. Symmetry considerations lead to suggestions of physical mechanisms underlying variety of experimental facts. Diagrams, tables. 9 ref. (P15, M26, Te)

202-P. Hartree-Fook-Slater Self-Consistent Field and the Calculation of Some Properties of the Cu^{+} Ion. J. C. Morrow. *Journal of Physical Chemistry,* v. 58, Mar. 1954, p. 245-247.

Calculation of diamagnetic susceptibility, polarizability and refractivity, Lamb diamagnetic shielding at the nucleus and structure factors for X-ray and fast electron scattering. Tables. (P16, Cu)

203-P. (Russian.) **Calculation of Total Electrical Resistance of Multi-Wire Steel Conductors.** A. M. Ganelin. *Elektrichestvo,* 1953, no. 11, Nov., p. 59-60.

Shows necessity of introducing correction coefficients. Graph. (P15, ST)

204-P. (Russian.) **Measurement of Small Vapor Pressures at High Temperatures. IV. Partial Vapor Pressures of Components in the System Silver-Lead. V. Partial Vapor Pressures of Components in the System Iron-Phosphorus.** A. A. Granovskaia and A. P. Lieubimov. *Zhurnal Fizicheskoi Khimii,* v. 27, no. 10, Oct. 1953, p. 1437-1445.

Evaporation from an open surface and utilization of radioactive isotopes. Tables, graphs, diagram. 3 ref. (P12, Ag, Pb, Fe)

205-P. (Russian.) **Migration and Distribution of Components of Metal Alloys in an Electric Field.** S. I. Drakin. *Zhurnal Fizicheskoi Khimii,* v. 27, no. 10, Oct. 1953, p. 1586-1591.

State of equilibrium and kinetics of electrodiffusion. Differences of average ion charges in various alloys. Graphs, table. 18 ref. (P15, N1)

206-P. (Book.) **The Actinide Elements.** Glenn T. Seaborg and Joseph J. Katz, editors. National Nuclear Energy Series IV-14A. 870 p. 1953. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $11.75.

Chemistry and nuclear properties of actinium, uranium, protactinium, thorium, plutonium, neptunium, americium, curium and their isotopes. (P10, P13, EG-h)

207-P. (Book.) **Heat Transfer Symposium, Engineering Research Institute.** 286 p. 1953. University of Michigan Press, Ann Arbor, Mich. $5.00.

One of a series on fundamental engineering topics. (P11)

Q

Mechanical Properties and Test Methods; Deformation

343-Q. Research on Pipe Flanges. *Engineering,* v. 177, Feb. 26, 1954, p. 275-276.

Strain gage tests on creep behavior. (Q25, Q3, CN, AY)

344-Q. Low-Cost Alloys Offer Good Heat Resistance. II. R. W. Boring. *Iron Age,* v. 173, Mar. 11, 1954, p. 146-148.

Mechanical and physical properties of low-cost Cr-Mn-Ni-Si and Cr-Mn-Si alloy steels can replace some of the more expensive and harder to get heat resistant alloys. Photographs, tables. (Q general, P general, AY)

345-Q. Endurance Limit of Zirconium Spreads Over Wide Range. W. P. Wallace and R. H. Wallace. *Iron Age,* v. 173, Mar. 18, 1954, p. 146-147.

Testing of specimens of crystal bar zirconium under repeated stress at room temperature. Zirconium does not have a clearly defined endurance limit. Graphs, micrographs, tables. (Q7, Zr)

346-Q. Analysis of Plastic Deformation in a Steel Cylinder Striking a Rigid Target. E. H. Lee and S. J. Tupper. *Journal of Applied Mechanics,* v. 21, Mar. 1954, p. 63-70.

G. I. Taylor dynamic compression test consists of firing a cylinder of material to be tested at a target of hardened armor plate and deducing dynamic yield stress from resulting deformation. Theoretical determination of entire strain distribution in such a test cylinder of nickel-chromium steel. Diagrams, photographs, graphs, 9 ref. (Q25, AY)

347-Q. Determination of Stresses in Cemented Lap Joints. C. D. Coxe. *Journal of Applied Mechanics,* v. 21, Mar. 1954, p. 90-91.

Stress-analysis concepts and importance of nonuniform distribution of stresses in brazed joints. 1 ref. (Q25, K8)

348-Q. A Quantitative Measure of Temper Embrittlement. Norman Brown. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 361-365.

Theories of flow and fracture show difference in reciprocals of transition temperatures is a quantitative measure of temper embrittlement. Experimental data support this conclusion. Tables, graphs. 18 ref. (Q23)

349-Q. On the Effects of Oxygen on Molybdenum. R. E. Maringer and A. D. Schwope. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 365-366.

Embrittlement effect studied by internal friction measurements. Graph, photograph, table, micrograph. 2 ref. (Q23, Q22, Mo)

350-Q. Load-Temperature History of Lattice Strain in Aluminum Alloy. D. Rosenthal and M. Kaufman. *Journal of Metals,* v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 200, Mar. 1954, p. 377-380.

Results indicate that neither X-ray nor lattice strains constitute suitable parameter for finding equation of state. Photographs, graphs. 4 ref. (Q27)

351-Q. Discontinuous Flow in Zinc Crystals and Its Relationship to Strain Ageing. M. J. Dumbleton. *Physical Society, Proceedings,* v. 67, no. 410B, Feb. 1954, p. 98-104.

Nitrogen-treated zinc crystals can strain-age under an applied stress and during creep, provided creep rate is small enough. Graphs. 25 ref. (Q24, Q3, Zn)

352-Q. Fatigue Tests of Spot Welds in Cor-Ten and Mild Steel. Georges Welter and André Choquet. *Welding Journal,* v. 33, Mar. 1954, p. 135S-140S.

Fatigue tests and distribution of stresses in multiple Cor-Ten and mild steel spot welded sheets with and without hydrostatic treatment. Tables, diagrams, graphs. 9 ref. (Q7, AY, CN)

353-Q. Behavior of Materials Under Conditions of Thermal Stress. S. S. Manson. Paper from "Heat Transfer Symposium". University of Michigan Press. p. 9-76.

Data contained in recent reports on mathematics of thermal shock. Examines variables in a simplified relation and deduces how thermal stress can be minimized. Graphs, tables, photomicrographs, diagrams. 23 ref. (Q25, Fe)

354-Q. Embrittlement of Austenitic Chrome-Nickel Steels at High Temperatures. I-III. G. Hoch. *Henry Brutcher, Altadena, Calif., Translation no.* 3176-3178. 61 p. (From *Archiv für das Eisenhüttenwesen,* v. 23, nos. 7-8, 1952, p. 257-276.)

Previously abstracted from original. See item 856-Q, 1952. (Q23, SS)

355-Q. The Effects of Stress Concentrations on the Rupture Strength of Metallic Materials Subjected to Creep Loading. G. Sachs, D. P. Newman and W. F. Brown, Jr. *Henry Brutcher, Altadena, Calif., Translation no.* 3179. 17 p. (From *Zeitschrift für Metallkunde,* v. 44, no. 6, 1953, p. 233-239.)

Previously abstracted from original. See item 765-Q, 1953. (Q23)

356-Q. (English.) **The Theory of Plasticity in Relation to Its Engineering Applications.** Hugh Ford. *Zeitschrift für angewandte Mathematik und Physik,* v. 5, no. 1, Jan. 15, 1954, p. 1-35.

Basic laws of mathematical theory; techniques for solving problems; examples of application of these laws; and techniques to study industrial processes. Diagrams, graphs. 43 ref. (Q23)

357-Q. (Dutch.) **Composition and Mechanical Properties of Nodular Cast Iron.** J. Kol. *Metalen,* v. 9, no. 3, Feb. 15, 1954, p. 34-38.

Effect upon mechanical properties by additions of manganese, phosphorus and various other elements (nickel, copper, aluminum, titanium, etc.). Tables, charts. 10 ref. (Q general, CI)

358-Q. (French.) **New Method of Determining Temper Brittleness of Steels.** Bernard Jaoul and Paul Lacombe. *Comptes rendus,* v. 238, no. 7, Feb. 15, 1954, p. 817-819.

Radioactive elements penetrate under steel surface. Procedure is superior to optic microscopy and is applicable to all corrosion problems. Graphs. 3 ref. (Q23, R general, ST)

359-Q. (French.) **Influence of Copper on Some Properties of Gray Iron.** Jacques Foulon and Albert de Sy. *Fonderie,* 1954, Jan., no. 96, p. 3755-3773; disc., p. 3774.

Up to 3% copper increased tensile strength and hardness and reduced impact resistance. Results agree with theoretical predictions. Tables, graphs, micrographs. 18 ref. (Q23, Q6, Q29, CI, Cu)

360-Q. (French.) **The Study of Modulus of Elasticity of Metallic Alloys.** René Le Roux. *Métaux, Corrosion-Industries,* v. 29, no. 341, Jan. 1954, p. 24-36.

Study of anisotropy of elasticity. Tables, graphs, photographs, diagrams. 49 ref. (To be continued.) (Q21)

361-Q. (French.) **C.E.C.M. Conference of Dec. 18, 1953. Results of the Statistical Study of the Mechanical Characteristics of Steels A37 and A42. I-II.** H. Herbiet and L. Dor. *Ossature metallique,* v. 19, no. 2, Feb. 1954, p. 93-103.

Tests and statistical results. Tables, graphs. (Q general, S12, CN)

362-Q. (French.) **Method of Measuring Residual Welding Stresses.** R. Gunnert. *Soudure et Techniques connexes,* v. 8, nos. 1-2, Jan.-Feb. 1954, p. 43-51.

A special extensometer measures distances before and after relieving of stresses between conical impressions spaced 9 mm. apart. Graph, diagrams, photograph, table. 5 ref. (Q25)

363-Q. (German.) **Flexure Analysis of Transfer Surfaces and Its Application in Hall Construction.** K. Hruban. *Acta Technica Academiae Scientiarum Hungaricae,* v. 7, nos. 3-4, 1953, p. 425-464.

Effects of loads on bearing surfaces in large-span roof construction. Formulas for stress and strain components. Photographs, diagrams, table. 5 ref. (Q27)

364-Q. (German.) **Fatigue Stress and Crystal State. III. Relation Between Crystal Deformation and Hardening or Failure.** Hermann Möller and Max Hempel. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 39-60.

Mechanism of fatigue failure is characterized by transition from homogeneous to nonhomogeneous crystallite deformation and from shear to bending slip. Diagrams, micrographs, tables. 39 ref. (Q7, M26)

365-Q. (German.) **Notch Impact Strength of Soft Fine-Grained Steels in Unaged and Aged State.** Heinz Kornfeld. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 61-70; disc., p. 70.

Formula based on experiments. Tables, graphs. 5 ref. (Q6, ST)

366-Q. (German.) **Strength Properties of Arc Welds of Water Quenched Basic Bessemer Steel.** Jakob Colbus. *Archiv für das Eisenhüttenwesen,* v. 25, nos. 1-2, Jan.-Feb. 1954, p. 77-84.

Shows superiority of water-quenched, aluminum-killed steels with 0.15 to 0.20% carbon. Diagrams, graphs, tables. 6 ref. (Q23, K1, AY)

367-Q. (German.) **Aluminum-Zinc Alloys. Mechanical Properties of Aluminum-Zinc Alloys With 22 to 70% Aluminum and Influence of Various Additions.** E. Pelzel. *Metall,* v. 8, nos. 3-4, Feb. 1954, p. 83-88.

Effects of magnesium, lead, iron, silicon and up to 5% copper additions. Tables, graphs, micrographs. 14 ref. (Q general, Al, Zn)

368-Q. (German.) **Strain Measurements on Welded Structures.** A. Erker. *Schweissen und Schneiden,* v. 6, no. 2, Feb. 1954, p. 66-69.

Notch effect at undercuts, effect of initial curvature and influence of internal stresses. Diagrams, graphs. 8 ref. (Q25, K general)

369-Q. (German.) **Three Years Experience With Micro-Abrasion Tester.** P. Grodzinski. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 20, no. 1, Jan. 1954, p. 9-18.

Compares results with other methods. Photographs, graphs, diagrams, table, micrographs. 17 ref. (Q9)

370-Q. (German.) **Investigation of Plastic Supporting Action in Notched Rods.** E. Siebel and A. Hosang. *VDI Zeitschrift des Vereines deutscher Ingenieure,* v. 96, no. 4, Feb. 1, 1954, p. 98-101.

Safe average stress in a notched cross section must be below yield stress as determined by tensile test. Graphs, diagrams, tables. 6 ref. (Q27, ST, Al)

371-Q. (German.) **Mechanism of Plastic Deformation.** G. Leibfried and P. Haasen. *Zeitschrift für Physik,* v. 137, no. 1, Feb. 19, 1954, p. 67-88.

Genetic relationships between various stages of plastic deformation of metallic crystals and differences in behavior of cubic face-centered and hexagonal crystals. Phenomenon of plastic flow is discussed. 52 ref. (Q24)

372-Q. (Hungarian.) **The Effect of Chromium and Boron on the Quality of Malleable Cast Iron.** Elek Chapo. *Ontöde,* v. 5, no. 2, Feb. 1954, p. 25-30.

Laboratory and pilot-plant experiments made on cast iron alloys containing 2.5 to 3.0% carbon, 0.9 to 1.2% silicon and 0.2% sulfur. Boron and chromium contents also varied. Tables, graphs, photographs, micrographs. 4 ref. (Q general, B, Cr, CI)

373-Q. (Italian.) **The Damping of Elastic Waves in Lead at High Temperature.** P. G. Bordoni and M. Nuovo. *Nuovo cimento,* v. 11, ser. 9, no. 2, Feb. 1, 1954, p. 127-141.

Damping of longitudinal vibrations measured in range from 10 to 40 kc. and for temperatures between 300 and 600° K. Graphs, diagrams, table. 20 ref. (Q8, Pb)

374-Q. (Russian.) **Nature of Deformation at Yield Stage of Metals.** V. S. Ivanova. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 217-220.

Experiments show that in volumes in which stepwise plastic deformation took place, deformation was 2.5% for iron. Graphs. 9 ref. (Q27, Fe)

375-Q. (Russian.) **Influence of Temperature on the Strength of Brittle Metallic Materials.** V. V. Baron and E. M. Savitskii. *Doklady Akademii Nauk SSSR,* v. 94, no. 2, Jan. 11, 1954, p. 269-272.

Tensile and compressive strengths and hardness of copper, silicon, nickel-silicon and copper-silicon alloys, germanium and cobalt.
(Q23, Cu, Si, Ni, Co, Ge)

376-Q. (Russian.) **Fatigue Strength of Multiple Welds of Low Carbon Steel and Possible Ways of Increasing It.** A. V. Obukhov, M. M. Kraichik and E. A. Greil. *Vestnik Mashinostroeniia,* v. 33, no. 11, Nov. 1953, p. 81-84.
Spot welding of structural steel. Better results were obtained with double-shear connectors than with the single-shear type. Diagrams, photograph, graphs. 4 ref.
(Q7, K3, ST)

377-Q. (Swedish.) **The Mechanism of Fatigue in Metallic Materials.** B. Ström. *Jernkontorets Annaler,* v. 138, no. 1, 1954, p. 17-38.
Survey of literature. Diagrams, graphs, tables, photographs, micrographs. 60 ref. (Q7)

378-Q. (Swedish.) **Checking of Methods for Determining the Primary Permanent Elongation.** G. Malmberg. *Jernkontorets Annaler,* v. 138, no. 1, 1954, p. 39-52.
Methods of determining uniform permanent elongation on different types of structural steels. Importance in cold stretched steel emphasized. Graphs, diagrams. (Q27, ST)

379-Q. The Determination of the Texture of Sheet Steel From Torque Curves. L. R. Blake. *British Journal of Applied Physics,* v. 5, Mar. 1954, p. 98-104.
Torque curve used as means of control during mechanical and heat treatment; information on orientation obtained without elaborate analysis. Photographs, tables, diagrams, graphs. 11 ref. (Q24, Fe)

380-Q. The Load-Deflection Relationship for a Partially Plastic Rolled-Steel Joist. J. W. Roderick. *British Welding Journal,* v. 1, Feb. 1954, p. 78-82.
Generalized theory which takes account of true stress-strain relationship gives good agreement with observed deflections of simply supported rolled-steel joists when these are loaded well into plastic range. Diagrams, graphs. 5 ref. (Q23)

381-Q. Vanadium as Replacement for Molybdenum in Low-Alloy Steels. C. L. M. Cottrell and B. J. Bradstreet. *British Welding Journal,* v. 1, Feb. 1954, p. 82-86.
Substitution results in much lower transition temperature combined with much higher values of proof stress without adversely affecting weldability of steels. Tables, graph, micrographs. 8 ref.
(Q23, K9, Va, Mo, AY)

382-Q. Hardness Conversion Tables. *Materials & Methods,* v. 39, Mar. 1954, p. 135, 137.
Data sheet of relationships between values determined on Rockwell, Rockwell superficial and Tukon hardness testers. (Q29)

383-Q. Stress Concentration Problems in Hollow Drill Steel. W. H. McCormick and H. J. Benecki. *Mining Engineering,* v. 6, Mar. 1954, p. 282-283.
Potential problem areas and suggested solutions. Photographs.
(Q25, TS)

384-Q. On the Nature of Viscous Destruction of Metals. V. A. Pavlov. *National Science Foundation Translation,* no. 100, Oct. 1953, 3 p. (From *Doklady Akademii Nauk SSSR,* v. 91, no. 2, July 11, 1953, p. 253-255.)
Previously abstracted from original. See item 91-Q, 1954.
(Q26, Q24, Q6)

385-Q. The Path of the Deformation Process as a Basic Characteristic of the Deformed State of a Plastic Body. S. I. Gubkin and Ye. S. Bogdanov. *National Science Foundation Translation, no.* 125, Nov. 1953, 4 p. (From *Doklady Akademii Nauk SSSR,* v. 88, 1953, p. 967-970.)
The only deformation variable proportional to expended work and to change in the physical state of the metal is intensity. 3 ref. (Q24)

386-Q. Wear Resistance of Carbon Steel Subjected to Rubbing in Certain Liquid Media After Diffusion Chromizing. M. M. Khrushchov, M. A. Babichev and G. N. Dubinin. *National Science Foundation Translation, no.* 196, Feb. 1954, 4 p. (From *Doklady Akademii Nauk SSSR,* v. 92, no. 2, Sept. 11, 1953, p. 303-306.)
Previously abstracted from original. See item 173-Q, 1954.
(Q9, CN, Cr)

387-Q. On the Correspondence Between Relaxation and Rate Characteristics in Plastic Extension. L. I. Vasilyev. *National Science Foundation Translation, no.* 195, Feb. 1954, 2 p. (From *Doklady Akademii Nauk SSSR,* v. 92, no. 2, Sept. 11, 1953, p. 301-302.)
Previously abstracted from original. See item 172-Q, 1954.
(Q23, Sn, Cu, Ni)

388-Q. The Yield Strength of Partly Ordered Cu_3Au Wires. W. D. Biggs and T. Broom. *Philosophical Magazine,* v. 45, 7th ser., no. 362, Mar. 1954, p. 246-248.
Dependence of yield stress on size of ordered domains investigated by tensile deformation of polycrystalline wires. Graph, table. 2 ref.
(Q23, Au, Cu)

389-Q. Etch Pit Attack on Plastically Deformed Aluminium. P. J. E. Forsyth. *Philosophical Magazine,* v. 45, 7th ser., no. 362, Mar. 1954, p. 344-345 + 4 plates.
Removal of surface containing slip steps eliminates tendency for etch pit alignment. 2 ref. (Q24)

390-Q. Ferrous Alloys. A Little Carbon Goes a Long Way. Harry K. Ihrig and John T. Jarman. *Steel,* v. 134, Mar. 22, 1954, p. 96-97.
Less than 1% carbon in steel will increase tensiles several fold. When subsequently heat treated, high hardness is obtained. Phase diagram, table. (Q23, Q29, ST)

391-Q. Hardness Testing Equipment and Methods. John E. Hyler. *Tooling and Production,* v. 19, Mar. 1954, p. 84, 106-112.
Magnetic hardness, multiple-angle testers and microhardness testing. Photographs. (Q29)

392-Q. Experimental Stress Analysis of Stiffened Cylinders With Cutouts. Pure Bending. Floyd R. Schlechte and Richard Rosecrans. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3073, Mar. 1954, 41 p.
Bending tests on a cylindrical semi-monocoque shell of circular cross section. Graphs, photograph, diagrams, tables. 4 ref. (Q25, Al)

393-Q. Fatigue Investigation of Full-Scale Transport-Airplane Wings. Summary of Constant-Amplitude Tests Through 1953. M. J. McGuigan, Jr., D. F. Bryan and R. E. Whaley. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3190, Mar. 1954, 45 p.
Constant-amplitude tests conducted by resonant-frequency method at four different alternating load levels about a level-flight mean load. Photographs, diagrams, tables, graphs. 12 ref. (Q7)

394-Q. Deformation of Single Crystals. Earl R. Parker and Jack Washburn. Paper from "Modern Research in Physical Metallurgy". American Society for Metals, p. 186-204.
Recently developed techniques for investigating deformation characteristics of metals. Photographs, graphs, diagrams, micrographs. 19 ref. (Q24)

395-Q. High Speed Strain Measurements. G. R. Irwin. Paper from "Modern Research in Physical Metallurgy". American Society for Metals, p. 205-224.
Recent experiments on rapid single pulse stressing of metals into plastic range to illustrate factors of primary importance to successful experimental work. Oscillograms, graphs, diagrams. 18 ref. (Q25)

396-Q. The Metallurgical Use of Anelasticity. C. Wert. Paper from "Modern Research Techniques in Physical Metallurgy". American Society for Metals, p. 225-250.
How measurements are made. Interpretates results. Graphs, table, diagrams. 13 ref. (Q22)

397-Q. (French.) **New Method of Studying Wear by Means of Radioactive Tracers.** Bernard Jaoul. *Comptes rendus,* v. 238, no. 6, Feb. 8, 1954, p. 648-649.
Wear of dies during hot extruding of steels is studied by applying a photographic film of appropriate sensitivity on surface-activated die. Graph, diagram. (Q9, S19, F24, ST)

398-Q. (French.) **Appearance of the Surface of Polycrystalline Specimens Subjected to Work-Hardening and Then to Gradual Annealings.** Jean Hérenguel. *Comptes rendus,* v. 238, no. 6, Feb. 8, 1954, p. 688-690.
Specimens of pure aluminum and Al-3% Mg alloy were deformed up to 400% by rolling. Surface textures were compared with specimens deformed by tension. Photographs. 6 ref. (Q24, Al)

399-Q. (French.) **Internal Friction of Alpha-Iron Due to the Presence of Carbon and Nitrogen in Solution.** Léon Guillet and Bernard Hocheid. *Comptes rendus,* v. 238, no. 8, Feb. 22, 1954, p. 905-906.
Variations of damping studied as a function of temperature. 10 ref.
(Q22, Q8, Fe)

400-Q. (German.) **Designing Boiler Parts for Temperatures Exceeding 500° C.** W. Dörrscheidt. *Brennstoff-Wärme-Kraft,* v. 6, no. 3, Mar. 1954, p. 90-92.
Strength properties and admissible stresses of different steels at various temperatures. Graphs. 8 ref. (Q23, ST)

401-Q. (German.) **Strength Properties and Solution Annealing Time of Shapes From Hardenable Aluminum Alloys.** W. Rosenkranz. *Metall,* v. 8, nos. 5-6, Mar. 1954, p. 177-179.
Experimental results. Time for achieving maximum strength is short. Graphs, tables. (Q23, J27, Al)

402-Q. The Ductility of Whiteheart Malleable Iron. G. N. J. Gilbert. *British Cast Iron Research Association. Journal of Research and Development,* v. 5, Feb. 1954, p. 169-172 + 6 plates.
Iron of balanced sulfur content having a black fracture is shown to have impact properties at room temperature superior to irons having the conventional whiteheart fracture. Graphs, diagrams, photographs, tables, micrographs.
(Q6, CI)

403-Q. The Ductilometer Test. A New Method of Establishing the Ductility of Metals. E. Jonnerby. *Ericsson Review,* 1953, no. 4, p. 119-127.
Design and operation of instrument to determine ductility of wire, sheet or strip. Tables, graphs, photographs, diagrams. (Q23, Cr, Mo, Pb, Al, Cu, CN, SS, Zn)

404-Q. Test Determines Presence of High Residual Stresses in Stainless. Hyman Kirtchik. *Iron Age,* v. 173, Apr. 1, 1954, p. 130-133.

Type 410 stainless steel can be tested to determine whether stresses are high enough to cause cracks in subsequent service. Table, graph. (Q25, SS)

405-Q. Deflections of Laterally Loaded Square Plates Under Various Edge Conditions. Toshio Nishihara and Kichinosuke Tanaka. *Memoirs of the Faculty of Engineering, Kyoto University,* v. 15, no. 4, Oct. 1953, p. 197-212.

Assuming plate is clamped or supported at edges, a fundamental solution is derived suitable to any boundary condition. Coefficients included in solution by various boundary conditions, are determined. Tables. 2 ref. (Q23)

406-Q. Approximate Analysis of Structures in the Presence of Moderately Large Creep Deformations. N. J. Hoff. *Quarterly of Applied Mathematics,* v. 12, Apr. 1954, p. 49-55.

Limiting state of stress and strain approached as creep strain becomes large as compared to elastic strain can be determined on basis of simple nonlinear stress-strain rate law. Graphs. 7 ref. (Q3, Q21)

407-Q. (Russian.) **Effect of Hardening by Heating With High-Frequency Currents on Strength of Cast Iron Parts.** Ia. E. Gol'dshtein. *Vestnik Mashinostroeniia,* v. 34, no. 2, Feb. 1954, p. 55-62.

Experimental investigation. Tables, graphs, micrographs, photograph. 10 ref. (Q23, J2, CI)

408-Q. (Russian.) **High-Frequency Heat Treatment of Ferrite-Pearlitic Malleable Iron.** P. I. Rusin. *Vestnik Mashinostroeniia,* v. 34, no. 2, Feb. 1954, p. 66-67.

Hardness and microhardness tabulated. Hardness increases with pearlite content and C-pockets. Micrographs, tables. (Q29, J2, CI)

409-Q. (Pamphlet.) **Characteristics of Pipe Bends Under Applied Moments; Summary Report Naval Research Laboratory, PB111292.** Dec. 1953, 22 p. Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $0.75.

Preliminary tests to determine applicability of rod theory to tubes indicate that maximum shear stress in the bend may be more than 200% larger than that calculated for a curved rod of the same section. Also there are significant shear stresses adjacent to the weld in both bend and tangent, even though only in-plane or out-of-plane moments are present. Use of rod theory is considered justifiable in large-bend piping systems, inasmuch as the error is small and calculation is greatly simplified. (Q5)

410-Q. (Pamphlet.) **Shear Stresses in Curved Tubes.** Naval Research Laboratory, PB111249, Oct. 1953, 11 p. Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. $0.50.

Relates recently discovered characteristics of pipe bends to work of earlier experimenters. Theoretical solutions to stresses and flexibilities of curved tubes are reported adequate when bend radius is greater than 10-tube radii. Such calculations are also sufficiently accurate for bend radii as low as 2-tube when bend turns through an angle of at least 90° and is not terminated by flanges or other constraints. For lesser bend angles and under conditions of constraint, this report gives more precise experimental values that are not explainable by present theoretical considerations. (Q5, Q2)

411-Q. (Pamphlet.) **Torsional Strength and Stiffness Tests of Wing Leading Edges.** J. F. Besseling and W. K. G. Floor. *Netherlands National Luchtvaartlaboratorium Report* S.421, June 1953, 42 p. + 2 plates.

Torsion tests on 36 wing leading edges stiffened only by full-web ribs. Tables, graphs, photographs, diagrams. 6 ref. (Q1, Al)

412-Q. (Book.) **Characteristics and Applications of Resistance Strain Gages.** National Bureau of Standards Circular 528. 140 p. 1954. U. S. Government Printing Office, Washington 25, D. C. $1.50.

Proceedings of symposium held Nov. 8 and 9, 1951. Proven applications, development of conducting coatings, special temperature compensating gages, and measurement of large plastic strains. (Q25)

413-Q. (Book.) **Statistics and Strength of Materials.** Roland H. Trathen. 506 p. 1954. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $7.50.

Principles of statics and strength of materials and general methods of applying them to engineering problems. (Q general)

414-Q. (Book—French.) **Mathematical Structure of the Theories of Visco-Elasticity.** Bernhard Gross. 74 p. 1953. Herman & Cie, 6, rue de la Sorbonne, Paris, France. $2.00.

A phenomenological theory of visco-elastic behavior based on concept of distribution functions. Analogies of visco-elastic and dielectric behavior; of linear network theory; magnetic after effect; and linear integral equations are stressed. (Q21, P10)

R Corrosion

167-R. Stability of Refractories in Liquid Metals. E. L. Reed. *American Ceramic Society, Journal,* v. 37, Mar. 1954, p. 146-153.

Corrosion of molybdenum, tungsten, tantalum, rhenium and ceramic materials by liquid sodium, bismuth and tin. Photographs, diagrams, micrograph, tables, graph. 6 ref. (R6, Na, Bi, Sn, Mo, W)

168-R. Control of Internal Corrosion of Tankers. William B. Jupp and Carl J. Lamb. *American Society of Naval Engineers, Journal,* v. 66, Feb. 1954, p. 152-165.

Effects of corrosion on ship life. Mechanical and electrochemical approaches in solving problem. Tables. 9 ref. (R general)

169-R. Cathodic Protection. Its Application to Ships and Establishments of the Royal Navy. J. T. Crennell. *Chemistry & Industry,* 1954, no. 8, Feb. 20, p. 204-209.

Read at Symposium conducted by corrosion group of Society of Chemical Industry, London, Nov. 1953. Current measurement and use of magnesium and zinc anodes and effects of cathodic protection on paint and antifouling. Reviews protection of aluminum and stainless steel. Diagrams, photographs. 6 ref. (R10, Al, CN, SS)

170-R. Effect of Operating Conditions on Corrosion of Hot Water Piping in Buildings. Henry L. Shulden-er. *Corrosion,* v. 10, Mar. 1954, p. 85-90.

Design and fabrication of distribution system, corrosiveness and scale-forming characteristics of water and nature of piping materials. Diagrams. 11 ref. (R4)

171-R. Measured Potentials as Related to Corrosion and Polarization in Local Cells. Thomas P. May and F. L. LaQue. *Corrosion,* v. 10, Mar. 1954, p. 91-94.

Irreversible electrode potentials of corroding metals, with particular reference to corrosion rates. Tables, graphs. 4 ref. (R1)

172-R. Sea Water Immersion Trials of Protective Coatings. J. H. Greenblatt. *Corrosion,* v. 10, Mar. 1954, p. 95-99.

Panel tests show that vinyl finishes can be used on cathodically protected hulls. Shipboard trials show that a controlled cathodic protection system is required. Table, graphs, photographs. 18 ref. (R10)

173-R. Some Notes on Hydrogen Blistering. *Corrosion,* v. 10, Mar. 1954, p. 101-102.

Data obtained on diffusion of atomic hydrogen through several kinds of steel in acidic solutions. In an electric furnace grade steel, diffusion did not take place unless sulfide was present. Tables, graph, photograph. 2 ref. (R2, R5, ST)

174-R. Laboratory Methods for Evaluation of Inhibitors for Use in Oil and Gas Wells. E. C. Greco and J. C. Spalding, Jr. *Corrosion,* v. 10, Mar. 1954, p. 103-109.

Based on paper presented at Ninth Annual Conference and Exhibition of the National Association of Corrosion Engineers at Chicago, Mar. 1953. Methods used by ten major producing companies, four chemical manufacturing companies and a university were gathered. General classification of tests used in laboratory along with information as to correlation of such tests with field experience. Tables, graph. 2 ref. (R10)

175-R. Radioactive Tracers in the Study of Pitting Corrosion on Aluminum. P. M. Aziz. *Electrochemical Society, Journal,* v. 101, Mar. 1954, p. 120-123.

Radioactive cobalt and lead ions in solution were used to study distribution of local cathodes on aluminum alloy specimens which were actively pitting. Processes of film breakdown and repair on aluminum alloy specimens, after introducing them into a corrosive environment, were studied. Micrograph, radiographs. 10 ref. (R2, Al)

176-R. The Kinetics of Oxidation of High Purity Nickel. E. A. Gulbransen and K. F. Andrew. *Electrochemical Society, Journal,* v. 101, Mar. 1954, p. 128-140.

Effect of time, temperature and surface pretreatment studied in temperature range 400 to 750° C., using a vacuum microbalance technique. Tables, graphs. 31 ref. (R2, Ni)

177-R. Badly Corroded Holder Lift Plates Speedily Restored by In-Service Repairs. M. C. McCallum. *Gas,* v. 30, Mar. 1954, p. 40-42.

Method for repair of deteriorated steel plates. Protection from galvanic corrosion. Photographs. (R1)

178-R. Testing the Tendency to Stress-Corrosion Cracking. (Digest of "Improving the Testing Method for Determining the Susceptibility of Steel to Stress-Corrosion Cracking", by Wilhelm Rädeker. *Stahl und Eisen,* v. 73, Apr. 9, 1953, p. 485-492.) *Metal Progress,* v. 65, Mar. 1954, p. 140, 142, 144.

Previously abstracted from original. See item 303-R, 1953. (R1, ST)

179-R. Effect of the Frequency of Stress Cycles Upon the Fatigue of Steel in Surface-Active and in Corrosive Media. G. Karpenko. *Henry Brutcher, Altadena, Calif., Translation no.* 3202, 8 p. (From *Doklady Akademii Nauk SSSR*, v. 87, no. 5, 1952, p. 797-800.)

Previously abstracted from original. See item 780-Q, 1953. (Q7, R1, ST)

180-R. (Hungarian.) **Examination of the Cracks of the Tubes of "Vogelbusch" Evaporating Boilers Used in Alumina Plants.** Istvan Kurovszky. *Kohaszati Lapok*, v. 9, no. 1, Jan. 1954, p. 27-34.

Investigates tubes in two Hungarian factories. Causes of intercrystalline corrosion and elimination of defects. Diagrams, tables, micrographs, photographs. (R2)

181-R. (Russian.) **The Influence of pH on Process of Metal Corrosion.** L. I. Antropov. *Zhurnal Fizicheskoi Khimii*, v. 27, no. 11, Nov. 1953, p. 1631-1635.

Tests on iron, nickel, zinc and magnesium showed that corrosion velocity and potential was dependent on pH of the solution. Table. 19 ref. (R1, Fe, Ni, Zn, Mg)

182-R. The Corrosion-Metallurgical Aspects of Sucker Rods and Their Oil Well Service Performance. F. J. Radd and R. L. McGlasson. *Journal of Petroleum Technology*, v. 6; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 199, Mar. 1954, p. 37-44.

Mechanisms of corrosion and corrosion fatigue damages to sucker rods examined from a fundamental electrochemical viewpoint. Relationships of sucker rod microstructures to these damaging effects defined. Diagrams, photographs, micrographs. 15 ref. (R1)

183-R. Cathodic Protection Eliminates Condenser Failures. *Chemical Processing*, v. 17, Apr. 1954, p. 40-42.

No visible corrosion found after five years on units protected by magnesium anodes. Photographs. (R10, CI, Mg)

184-R. The Resistance to Failure of Condenser and Heat Exchanger Tubes in Marine Service. P. T. Gilbert. *Institute of Marine Engineers, Transactions*, v. 66, Jan. 1954, p. 1-6; disc., p. 6-20.

Types of corrosion causing failures. Development of alloys resistant to these types of attack. Table, photographs, micrograph. 25 ref. (R3, Cu, Ni, Al)

185-R. Cathodic Protection for Steel Mill Grounding Systems. J. F. Headlee. *Iron and Steel Engineer*, v. 31, Mar. 1954, p. 113-115; disc., p. 115.

Advances in grounding practices in past years. Diagram, table. (R10)

186-R. Treatment of Water for the Iron and Steel Industry. A. J. Lamb and A. H. Waddington. *Iron and Steel Institute, Journal*, v. 176, Mar. 1954, p. 291-302.

Types of water usually available, treatment necessary to make them suitable for particular purposes, design of plant used to effect treatment, chemical reagents more commonly used and plant control. Photographs, diagrams. (R4)

187-R. Control Your Corrosion Costs. L. R. Honnaker. *Steel*, v. 134, Mar. 22, 1954, p. 110-111.

Materials available to cut industry's multi-billion dollar corrosion bill. Fast identification of the trouble and correct inhibitor application guarantee impressive savings. Photograph. (R10)

188-R. Zinc-Rich Compounds Give Cathodic Protection. H. L. Grebinar. *Steel*, v. 134, Mar. 29, 1954, p. 113-114.

Coating can be brushed, sprayed or dipped. Using vinyl resins as binders, they contain 96% zinc by weight when dry. Photographs, table. (R10, Zn, ST)

189-R. Corrosion Resistance of Copper, Nickel, and Chromium-Plated Zinc, Aluminum, and Magnesium-Base Die Castings. M. R. Caldwell, L. B. Sperry, L. M. Morse and H. K. DeLong. Paper from "Electrodeposition Research". National Bureau of Standards Circular 529, p. 69-71; disc., p. 71-72. 1953. (Condensed from paper in *Plating*, v. 39, 1952, p. 142.)

Previously abstracted from original. See item 100-R, 1952. (R3, L17, Ni, Zn, Al, Mg, Cr)

190-R. (German.) **Intercrystalline Corrosion of Zinc-Aluminum-Copper Alloys.** E. Pelzel. *Metall*, v. 8, nos. 5-6, Mar. 1954, p. 169-173.

Study to determine structural connections between high and low aluminum content and influence of copper. Graphs, photographs, tables, diagram, micrographs. 6 ref. (R2, Zn, Al, Cu)

191-R. (German.) **Corrosion by Benzine and Chlorinated Hydrocarbons.** W. Katz and J. Sonntag. *Metall*, v. 8, nos. 5-6, Mar. 1954, p. 203-205.

Stability determined for pure aluminum, aluminum-magnesium alloys, duraluminum, die-cast aluminum, zinc, lead and chromium-nickel steel. Tables, photographs, micrographs. 4 ref. (R6, Al, Mg, Zn, Pb, AY, Cr, Ni)

192-R. (German.) **Scaling of Metals by Sulfur and Sulfur-Containing Gases.** O. Kubaschewski and O. von Goldbeck. *Metalloberfläche*, Edition A, v. 8, no. 3, Mar. 1954, p. 33-36.

Influence of moisture and temperature varies with corroding compounds and with the metals. Tables. 40 ref. (R2, R9)

193-R. (German.) **Corrosion of Iron Resulting From Temperature Differences of Electrolytes.** Walter Breckheimer and Jean D'Ans. *Werkstoffe und Korrosion*, v. 5, no. 2, Feb. 1954, p. 43-48.

Iron electrodes immersed in neutral potassium chloride solution at varying temperatures will form a corrosion element. Diagrams, graphs. (R2, Fe)

194-R. (Polish.) **Investigation of Electrochemical Corrosion in Liquids of Low Dielectric Constants.** St. Minc and L. Stolarczyk. *Przemysl Chemiczny*, v. 10(33), no. 2, Feb. 1954, p. 69-72.

Behavior of steel, copper, brass and aluminum in various solutions. Diagrams, graphs, micrographs. 6 ref. (R5, ST, Cu, Al, Zn)

195-R. (Polish.) **Corrosion Inhibitors of Steel in Sulfuric and Hydrochloric Acid.** H. Jodko. *Przemysl Chemiczny*, v. 10(33). no. 2, Feb. 1954, p. 75-80.

Investigates thiourea, dibenzene sulfoxide, "Tardiol F" and urotropine. Tables. 2 ref. (R10, ST)

196-R. Corrosion for Chemical Engineers. I. Corrosion and Design. L. L. Shreir. *Chemical & Process Engineering*, v. 35; *Corrosion Technology*, v. 1, Mar. 1954, p. 6-9.

Applies theoretical principles of corrosion to practical problems. Effect of metal, method of construction, shape, velocity of flow of the liquid and dissimilar metals in contact on the possibility of corrosion occurring. Graph, photographs, diagrams, table. 20 ref. (R general)

197-R. The Mechanism of Inhibition of the Corrosion of Iron by Sodium Hydroxide Solution. II. J. E. O. Mayne and J. W. Menter. *Chemical Society, Journal*, 1954, Jan., p. 99-103.

Film formed on iron by anodic discharge of hydroxyl ions is composed of material having cubic structure of either Fe_3O_4 or gamma-Fe_2O_3. Consequently it is indistinguishable from air-formed film. Graph. (R10, Fe)

198-R. The Mechanism of Inhibition of the Corrosion of Iron by Solutions of Sodium Phosphate, Borate, and Carbonate. J. E. O. Mayne and J. W. Menter. *Chemical Society, Journal*, 1954, Jan., p. 103-107 + 3 plates.

Film formed on iron by 0.1 normal solutions of disodium hydrogen phosphate, trisodium phosphate, sodium borate and sodium carbonate, in presence of air but in absence of air-formed film, removed by alcoholic iodine method. Composition determined by electron diffraction. Tables, micrographs, X-ray diffraction patterns. (R10, M22, Fe)

199-R. Aluminum Ground Connection Developed for Water Pipe. Robert Hickson. *Electrical World*, v. 141, Apr. 5, 1954, p. 128.

Bimetal contact with copper piping and corrosion are eliminated. Graph. (R10, Al, Cu)

200-R. Rate of Oxidation of Three Nickel-Chromium Heater Alloys Between 500° and 900° C. Earl A. Gulbransen and Kenneth F. Andrew. *Electrochemical Society, Journal*, v. 101, Apr. 1954, p. 163-170.

Studies of oxidation rate of three alloys as function of time and temperature. Data related to parabolic rate law and classical theory of diffusion. Tables, graphs. 20 ref. (R2, Ni, Cr)

201-R. Slag Deposition and Corrosion in Gas-Turbine Plants. J. Biert and R. Scheidegger. *Engineers' Digest*, v. 15, Mar. 1954, p. 97-100. (From *Schweizer Archiv*, v. 19, no. 12, Dec. 1953, p. 359-366.)

Previously abstracted from original. See item 133-R, 1954. (R7, SS)

202-R. A Study of Boehmite Formation on Aluminium Surfaces by Electron Diffraction. R. K. Hart. *Faraday Society, Transactions*, v. 50, Mar. 1954, p. 269-273 + 1 plate.

Action of boiling distilled water on aluminum, including mechanically polished, electropolished and anodized specimens investigated. Graph. 15 ref. (R4, M22, Al)

S

Inspection and Control

145-S. Direct Reading Spectrograph Gives Accurate Control in Aluminum Production. Donald L. Colwell and Oldrich Tichy. *Journal of Metals*, v. 6, Mar. 1954, p. 343-345.

Advantages of spectrographic control in manufacture of aluminum from scrap. Photographs, tables. (S11, C general, Al)

146-S. Application of the ARL Quantometer to Production Control in a Steel Mill. H. C. Brown. *Journal of Metals*, v. 6, Mar. 1954; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 200, Mar. 1954, p. 349-352.

Rapid means of analysis for production control of all types of stainless steel being used in analyses of final tests from a number of stainless, silicon and plain carbon steels. Tables, graphs. 2 ref. (S11, D general, SS, ST)

147-S. How Position Tolerances Affect Gaging Requirements. II. Earle Buckingham. *Machinery,* v. 60, Mar. 1954, p. 186-192.

Tolerances established to control variations in size, form position and function. Diagrams. (S14)

148-S. Highly-Developed Equipment for Inspecting Close-Tolerance Parts. C. H. Wick. *Machinery (London),* v. 84, Feb. 19, 1954, p. 397-401.

Multiple-dimension inspection and classifying machines of advanced design can be installed in production lines to enable high quality and close limits to be maintained in conjunction with rapid methods of manufacture. Photographs. (S14)

149-S. Design and Construction of Needle Thermocouples. W. Gerard Rauch. *Metal Progress,* v. 65, Mar. 1954, p. 71-74.

Couples having high thermo-elastic power hold their calibration well at temperatures up to 1110° F. Graphs, photographs. (S16)

150-S. Selection of Line Pairs for the Spectrographic Analysis of Low Alloy Steel. D. L. Fry and T. P. Schreiber. *Optical Society of America, Journal,* v. 44, Feb. 1954, p. 159-162.

Applicability of recent scientific information to procedures for spectrographic analysis of low-alloy steel under conditions of receiving inspection. Tables, graph. 7 ref. (S11, CN)

151-S. Measure Surface Roughness. *Precision Metal Molding,* v. 12, Mar. 1954, p. 63-64.

Tool for controlling and checking microfinish on metal parts. Table. (S15)

152-S. Control of Strip Thickness in Hot and Cold Rolling by Automatic Screwdown. R. B. Sims and P. R. A. Briggs. *Sheet Metal Industries,* v. 31, no. 323, Mar. 1954, p. 181-190, 203.

Control method uses existing mill screws to reposition rolls and keep strip to gage. Accuracy of ± .001 in. has been attained. Charts, diagrams, photographs, graphs, tables. 9 ref. (S14, F23)

153-S. Non-Destructive Testing. *South African Mining and Engineering Journal,* v. 64, pt. 2, Feb. 6, 1954, p. 83.

Equipment available and range of application. (S13, S14, S15)

154-S. Nondestructive Testing of Structures. Lloyd J. Oye. *Welding Journal,* v. 33, Mar. 1954, p. 223-233.

Development and economic factors of inspecting welded structures with magnetic particle and penetrant inspection. Value of program as a means of encouraging greater use of welded structures. Graphs, table, photographs. 11 ref. (S13, K general)

155-S. Nondestructive Test Methods for Inspection of Welded Joints. R. J. Krieger, S. A. Wenk and R. C. McMaster. *Welding Journal,* v. 33, Mar. 1954, p. 154S-160S.

Application of techniques to ship structures. Table. 3 ref. (S13, K9)

156-S. Influence of Structure of Plain Carbon and Alloy Steels Upon the Spark Stream in Spark Testing. J. Hunger and O. Werner. *Henry Brutcher, Altadena, Calif., Translation no.* 3198, 32 p. (From *Archiv für das Eisenhüttenwesen,* v. 23, nos. 7-8, 1952, p. 277-286.)

Previously abstracted from original. See item 440-S, 1952. (S10, CN, AY)

157-S. (English.) **Ultrasonic Testing of Mass Products in Water Immersion.** G. Keller. *Acta Technica Academiae Scientiarum Hungaricae,* v. 7, nos. 3-4, 1953, p. 359-387.

Testing equipment and methods permit reliable, swift detection and recording of discontinuities. Graphs, tables, diagrams, photographs, X-ray radiographs. 29 ref. (S13)

158-S. (German.) **New Possibilities of Nondestructive Material Testing in Aluminum Manufacturing Industry.** R. Pohlmann. *Aluminium,* v. 30, no. 2, Feb. 1954, p. 57-61.

Importance of supersonic test for determining breaks, segregations, slag inclusions, flaws and inhomogeneities. Diagrams, photographs. 3 ref. (S13, Al)

159-S. New Device Sorts Metals Accurately, Quickly. E. F. Weller and E. A. Hanysz. *Iron Age,* v. 173, Mar. 4, 1954, p. 162-165.

Nondestructive testing device accurately sorts mixed metals. Plating, foil and nonconductive film thickness can be measured. Photographs, graphs, diagrams, tables. (S10, S14)

160-S. Comparison Radiographs of Welds. Alexander Gobus and Noah A. Kahn. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145. p. 3-8.

Preparation of standard radiographs showing discontinuities usually found in production arc welds in steel. Photograph, radiographs. (S13, ST)

161-S. Fluoroscopy and Radiography With Iridium 192. C. Garrett, A. Morrison and G. Rice. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145. p. 9-20.

Preparation of source, protective equipment, operating techniques. Diagrams, graphs, photographs, tables, radiographs. 7 ref. (S13)

162-S. Weld Radiography. A Tentative Method for the Quantitative Evaluation of Defects. Oscar Masi. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145. p. 21-30.

Mechanical properties of welds determined by photometric studies of radiographs. Diagrams, photograph, radiographs, tables. (S13, Q general, K9, ST)

163-S. Critical Study of Techniques for the Testing of Materials by Ultrasonic Methods. Paul G. Bastien. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145. p. 31-42.

Trends in testing methods and consideration of errors caused by conditions of the ultrasonic emission on characteristics of the object tested. Diagrams, tables. (S13, S14)

164-S. Comparison of Nondestructive Tests on a Damaged Sternpost. A. De Sterke and H. Den Hartog. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145. p. 43-52.

Heavy steel castings in damaged ships were inspected by magnetic, gamma-ray, X-ray and ultrasonic methods. Results of tests compared. Photographs, diagrams, radiographs. (S13, CI)

165-S. Progress in the Field of Nondestructive Testing Through the Use of Ultrasonics. W. C. Hitt. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145. p. 53-75.

General review. Immersed scanning, flaw parallelism, reference blocks, sweep operation and typical parts inspected. Photographs, diagrams, reflectograms. (S13)

166-S. The Practical Application of Ultrasonic Nondestructive Testing. Werner A. Felix. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145. p. 76-88.

Results of tests on large forgings, steel castings and weld seams. Diagrams, photographs, tables. (S13, CI, ST)

167-S. Nondestructive Electronic Sorting of Metals for Physical Properties. Fritz Förster. Paper from "Symposium on Nondestructive Testing". ASTM Special Technical Publication no. 145, p. 89-98.

Instruments and their operation which eliminate effect of dimensional fluctuations almost completely. Graphs, photograph, diagrams. (S10, S14)

168-S. Establishing Standards for As-Cast Surfaces. Roy A. Loder. *American Foundryman,* v. 25, Apr. 1954, p. 44-45.

Duplicating casting finish desired by customer from order to order is possible when easily-understood standards are established. Photographs. (S22, S15, E general)

169-S. The Ultrasonic Testing of Forging Ingots. Robert N. Hafemeister. *ASTM Bulletin,* 1954, no. 197, p. 52-55.

Tests determine soundness of a forging by determining ultrasonically conditions of the ingot prior to forging. Oscillograms. (S13, ST)

170-S. The Correlation of the Betatron With Other Forms of Non-Destructive Testing. H. B. Norris. *ASTM Bulletin,* 1954, no. 197, p. 56-57.

Increased value of tests such as magnetic particle, ultrasonic and X-ray results when used in conjunction with the betatron. (S13)

171-S. Correlation of Gamma Radiography and Magnaflux Indications in the Inspection of Large Cast-Steel Connecting Rods. R. L. Thompson. *ASTM Bulletin,* 1954, no. 197, p. 58-59.

Detection of severe shrinkage cracking in a large steel casting. Correlation between gamma radiology and magnetic particle method resulted in greater information. Photographs. (S13, CI)

172-S. Application of Radio-Active Isotopes to Steel Foundry Radiography. L. Wilkinson. *Engineer,* v. 197, Mar. 12, 1954, p. 383-387.

Radioactive properties of cobalt-60, tantalum-182 and iridium-192 are largely complementary enabling thicknesses ranging from a ½ to 5 in. of steel to be examined with adequate contrast and sensitivity. Tables. (S19, CI)

173-S. Statistical Control in Metal-Working Operations. M. Whyte. *Institute of Metals, Journal,* v. 82, Mar. 1954, p. 334-344.

Sampling rates should be fixed in relation to quality and homogeneity of material being tested. Selection, control and sensitivity of routine tests. Graphs, table, charts. 17 ref. (S12)

174-S. A Simple Thermionic Vacuum Gauge. G. K. T. Conn and H. N. Daglish. *Journal of Scientific Instruments,* v. 31, Mar. 1954, p. 95-96.

Gage is simple and, because of form of anode, very easy to construct. Diagrams. 9 ref. (S14)

175-S. Examination of Machined Metal Surfaces. Use of Light-Profile Microscope. S. Tolansky. *Metal Treatment and Drop Forging,* v. 21, Mar. 1954, p. 103-111.

Light-profile microscope and how ordinary metallurgical microscope may be adapted. Application of technique to study of various bearing surfaces finished by different methods. Photographs, diagram, micrographs. 1 ref. (S15)

176-S. The Hallmark Through the Ages. Standard Marks for Gold and Silver. H. E. Lindsey. *Metal Treatment and Drop Forging,* v. 21, Mar. 1954, p. 131-137.

History of British system of hallmarking and its significance. Diagrams, tables. (S10)

177-S. Aspects of Angular Work. John E. Hyler. *Modern Machine Shop,* v. 26, Apr. 1954, p. 120-129.

Application of universal drafting machines and bevel protractors, special magnetic angle blocks, single and compound-angle sine plates, angle gage blocks and faceplate fixtures. Photographs, drawings. (S14)

178-S. A Preliminary Investigation of the Radiographic Visualization of Cracks. James W. Dutli and Gerold H. Tenney. *Nondestructive Testing,* v. 12, Mar.-Apr. 1954, p. 13-15.

Apparatus, techniques and results of experimental studies. Diagrams, graphs, photograph. (S13)

179-S. Some Unusual Radiographic Problems. M. D. Phillips, M. L. Rhoten and Clara Kimmel. *Nondestructive Testing,* v. 12, Mar.-Apr. 1954, p. 17-19.

Reviews and illustrates typical problems encountered in an X-ray laboratory. Radiographs, photographs. (S13)

180-S. Radiographic Characteristics of High Energy X-Rays. A. L. Pace. *Nondestructive Testing,* v. 12, Mar.-Apr. 1954, p. 21-25.

Utilization of high-voltage X-radiation in radiographic inspection reveals many interesting characteristics not observed with lower voltage X-rays. Graphs, diagrams, radiographs, photograph. (S13)

181-S. Application of Cesium 137 to Industrial Radiography. James W. Dutli and Grover M. Taylor. *Nondestructive Testing,* v. 12, Mar.-Apr. 1954, p. 35-38.

Fission-product isotope cesium-137 investigated for use as gamma-ray source for industrial radiography. Diagram, graphs, radiographs, tables. 6 ref. (S19)

182-S. An Investigation of Xeroradiography of Uranium With High Energy Sources. R. E. Cofield. *Nondestructive Testing,* v. 12, Mar.-Apr. 1954, p. 39-43.

Exposure conditions and operating techniques for xeroradiography of 0.125 to 1 in. uranium test objects developed by using both 1000 kv. X-ray and cobalt-60 sources. Tables, diagrams, xeroradiograph, graphs. 3 ref. (S13)

183-S. Soaking-Pit Instrumentation. L. F. Kopsa. *Instruments and Automation,* v. 27, Jan. 1954, p. 130-131, 141-142.

Instrumentation and combustion control for large one-way-fired soaking pits includes temperature control of recuperator and combustion air, pressure control of combustion air and flue draft, flow control of fuel and combustion air and various safety interlocks. Photographs, diagrams. (S16, S18, F1)

184-S. (Book.) **B.I.M.C.A.M. Handbook.** 133 p. 1953. British Industrial Measuring and Control Apparatus Manufacturers' Assn., 21 Tothill St., Westminster, London S.W. 1, England.

Instrumentation as it serves atomic energy, chemical, coal, electrical, gas, oil, and water industries. Contains numerous photographs. (S general)

185-S. (Book.) **Symposium on Non-Destructive Testing. ASTM Special Technical Publication no. 145.** 98 p. 1952. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $2.00. $1.50 to ASTM members.

Proceedings of meeting held at New York, June 1952. Fluoroscopy; electronic sorting; quantitative evaluation of defects; ultrasonic methods; and weld radiography. (S13)

T

Applications of Metals in Equipment

113-T. Steel and Titanium Alloy Extruded Shapes in Modern Aircraft. Keith A. Wilhelm. *Automotive Industries,* v. 110, Mar. 15, 1954, p. 266 + 11 pages.

Aircraft structures and applications of hot extruded ferrous and titanium alloys. Graphs, diagrams, charts. (T24, F24, AY, Ti)

114-T. Improved Transformer Design. *Canadian Metals,* v. 17, Mar. 1954, p. 20, 22, 24-25.

Transformers produced in a recently enlarged Canadian plant were redesigned, using a steel with oriented grain, to make a smaller, more efficient unit. Photographs. (T1, SG-p)

115-T. The Role of Aluminum as a Special Fuel. G. M. Babcock and F. B. Rethwisch. *Engineering and Mining Journal,* v. 155, Mar. 1954, p. 84-86.

Ability of aluminum to reduce oxides of iron, chromium, calcium, magnesium and carbon makes it extremely valuable when used as combined fuel and reducing agent in thermit welding and other chemical reduction processes. Photographs. (T29, T5, K4, Al)

116-T. Copper Tube for Piping Systems. Doremus L. Mills. *Heating, Piping & Air Conditioning,* v. 26, Mar. 1954, p. 129-131.

Characteristics and uses of various types. Tables, graph. (T27, Cu)

117-T. Ductile Iron: Makes Good on Tough Jobs. G. S. Farnham and Benton Dixon. *Iron Age,* v. 173, Mar. 18, 1954, p. 133-137.

Ductile iron's combination of toughness, impact resistance, machinability and good wear qualities have made it a preferred material for many of industry's toughest applications. Photographs. (T general, Q general, CI)

118-T. Liquid-Metal Heat Transfer. H. F. Poppendiek. Paper from "Heat Transfer Symposium", University of Michigan Press. p. 77-100.

"Liquid-metal heat transfer" refers to free and forced convection, and boiling heat transfer systems where the fluids are liquid metals. List of metals that may be used as heat transfer media. Differences between properties of the metals and ordinary fluids which significantly influence heat transfer are considered. Graphs, tables. 41 ref. (T general, P11)

119-T. (French.) **Cellular Bulkhead Structures of Steel-Plate Pilings. Detailed Study of Stresses of Circular Walls.** L. Descans. *Ossature metallique,* v. 19, no. 2, Feb. 1954, p. 77-84.

Vertical bending of pilings and possible consequences of poor construction. Photographs, graphs, tables, diagram. (T26, ST)

120-T. (Norwegian.) **Building Constructions of Steel. Brief Account of the Proposal for Revising NS 424.** Arne Selberg. *Teknisk Ukeblad,* v. 101, no. 7, Feb. 18, 1954, p. 133-138.

Proposed modernization of Norwegian standard. Graphs and tables on mechanical properties of different structural steels. (T26, S22, Q general, ST)

121-T. Wire Nails. G. G. M. Carr-Harris. *Canadian National Research Council, Technical Information Service Report no.* 34, Jan. 1954, 14 p.

Characteristics and methods of manufacture. 44 ref. (T7)

122-T. Materials. Aluminum Has Advantages for Tanks and Pressure Vessels. *Iron Age,* v. 173, Mar. 4, 1954, p. 174-176.

Lightness, corrosion resistance, nontoxicity and good thermal properties are advantages for design and fabrication. Diagrams. (T25, Al)

123-T. Where Pearlitic Malleable Irons Can Be Used to Advantage. Carl F. Joseph. *Materials & Methods,* v. 39, Mar. 1954, p. 100-101.

Stronger than standard malleable and approaching the properties of forgings, this versatile material is competing favorably with other metal forms in the automotive, ordnance, aircraft and other industries. Table, photographs. (T general, CI)

124-T. Materials & Methods Manual No. 103. Sandwich Materials. Kenneth Rose. *Materials & Methods,* v. 39, Mar. 1954, p. 117-132.

Core and facing materials and structural strength, insulating and special purpose laminates. Photographs, tables, graphs, diagrams. (T26)

125-T. Etchings and Nameplates. J. S. Mertle. *Photoengravers Bulletin,* v. 43, Mar. 1954, p. 5-36.

Developments and procedures for various metals, nonmetals, plastics and glass. (T9, Al, Cu, Mg, Ni, ST)

126-T. Success of a Carbide Tool Depends Upon Shank Selection. M. L. Backstrom. *Tooling and Production,* v. 19, Mar. 1954, p. 50-53, 161.

Quite often improper selection of tool body or shank material is responsible for detrimental tool performance, rather than carbide grade or machine tool upon which failure is usually blamed. Photographs, tables, graph. (T6, TS)

127-T. Steel Tubes for the Chemical Industry. W. E. Smith. *Chemical Age,* v. 70, Mar. 13, 1954, p. 617-621.

Manufacture of pipes for chemical handling problems. Photographs. (T29, F26, ST)

128-T. Design Requirements of Relay Core Materials. J. P. Martin. *Electrical Manufacturing,* v. 53, Apr. 1954, p. 138-141.

Crux of relationship of desired magnetic characteristics of materials to design factors lies in air-gap ratio. Photographs, graphs, table. (T1, P16)

129-T. Sleeve Bearing Application Factors. R. H. Josephson. *Electrical Manufacturing,* v. 53, Apr. 1954, p. 142-148.

Sleeve bearings now carry heavier loads at higher speeds and higher temperatures for longer periods of time. Defines demands put on bearings and how thin-wall insert bearing has met them. Diagram, graphs, tables, micrographs. (T7)

130-T. Germany Chooses Aluminum for Overhead Lines. T. Volgelsang. *Electric Light and Power,* v. 32, Mar. 25, 1954, p. 192-198.

Economic relationship between various metals for low, medium and high-voltage lines. Tables, graphs, diagrams, photographs. 2 ref. (T1, Al, Cu, ST)

131-T. Manufacture and Testing of Germanium Triodes. *Machinery Lloyd*

(*Overseas Ed.*), v. 26, Mar. 13, 1954, p. 81, 83-87.

Characteristics, construction and precautions. Photographs, diagrams. (T1, Ge)

132-T. Magnesium in Airborne Radar Systems. *Modern Metals,* v. 10, Mar. 1954, p. 36-37.

Widest possible use of magnesium in castings, structural weldments and formed sheet metal. Photographs. (T1, Mg)

133-T. Alibag for Selling Motor Oil. *Modern Metals,* v. 10, Mar. 1954, p. 38.

One-piece impact extruded aluminum container that looks like a cross between a can, bag and package. Photograph. (T10, Al)

134-T. Colorful Aluminum Yarn. *Modern Metals,* v. 10, Mar. 1954, p. 40, 42.

Tells how Metlon, a thin ribbon of aluminum foil coated on both sides with colored acetate, is made and how it is promoted. Photograph. (T10, Al)

135-T. Alumaroll Awnings. *Modern Metals,* v. 10, Mar. 1954, p. 78-79.

Made of aluminum, they roll up and down like canvas. Photographs. (T26, Al)

V

Materials

General Coverage of Specific Materials

110-V. The Quality of Toolsteel—Recent Developments and Future Predictions. Burns George. *Metal Progress,* v. 65, Mar. 1954, p. 75-78.

Improvements made possible with use of electric furnaces and quality inspections. Photograph. (D5, S general, TS)

111-V. German Investigations on Boron Steels. Robert Scherer and Karl Bungardt. *Metal Progress,* v. 65, Mar. 1954, p. 101-106, 174, 176, 178.

Use of boron saves nickel and chromium. Hardenability studies and tensile and impact properties. Graphs, tables. (J26, Q23, AY)

112-V. Vanadium-Bearing High Tensile Weldable Steels. *South African Mining and Engineering Journal,* v. 64, pt. 2, Feb. 6, 1954, p. 821, 823, 825.

Research work on possible replacement of molybdenum by vanadium for high-tensile weldable steels. Preparation of experimental steels, their heat treatment, and their mechanical properties. Tables. (J general, Q general, AY)

113-V. (Dutch.) **Titanium. II. Possible Workability and Special Properties.** E. C. Smits. *Bedrijf en Techniek,* v. 9, no. 196, Feb. 27, 1954, p. 105, 107, 109.

Behavior in casting, high-temperature forging, cutting, bending, deep drawing, plating and heat treating. Tendency of titanium to absorb oxygen and nitrogen at high temperatures. (Ti)

114-V. (Dutch.) **Copper and Copper Alloys. XIII. Brass.** W. G. R. De Jager. *Metalen,* v. 9, no. 3, Feb. 15, 1954, p. 42-43.

Hardness, tensile strength and annealing of three types of brass. Graph, table. (To be continued.) (Q29, Q23, J23, Cu)

115-V. Zirconium. L. Sanderson. *Canadian Mining Journal,* v. 75, Mar. 1954, p. 67-69.

History, physical, chemical and mechanical properties, use in nuclear energy production, reduction processes, sources, industrial applications and alloys. (Zr)

116-V. Rhenium Metal. Its Properties and Future. L. W. Kates. *Materials & Methods,* v. 39, Mar. 1954, p. 88-91.

Rhenium in ductile form investigated for electrical contacts, thermocouple alloys and pen points. Photographs, tables. 2 ref. (Re)

117-V. Chromium-Manganese Stainless Steels. John L. Everhart. *Materials & Methods,* v. 39, Mar. 1954, p. 92-94.

Continuing shortage of nickel is reviving interest in substitutes having properties that compare favorably with those of chromium-nickel steels. Tables, photographs. 9 ref. (SS, Cr, Mn)

118-V. Materials Data Sheet. Nitriding Steels. *Materials & Methods,* v. 39, Mar. 1954, p. 139.

Composition, physical, mechanical and fabricating properties, thermal treatment and corrosion resistance. (J28, AY)

119-V. Rhenium. *Metal Industry,* v. 84, Mar. 5, 1954, p. 190.

History, sources, recovery processes, fabrication methods and applications. Table. (Re)

120-V. Research Progress: Titanium Alloys. I. *Metal Industry,* v. 84, Mar. 5, 1954, p. 194.

Characteristics of principal alloys. (Ti)

121-V. Titanium. The Metal of 1954? II. Elmer H. Hahn, Jr. *Tooling and Production,* v. 19, Mar. 1954, p. 58-62, 65, 113.

Welding, grinding, machining, casting, forging and scrap recovery. Photograph. 40 ref. (Ti)

122-V. Effect of Impurities in Tin on the Properties and Uses of the Metal and Alloys Containing Tin. Charles L. Mantell. Paper from

"Symposium on Tin". ASTM Special Technical Publication no. 141. p. 57-83.

Comprehensive survey of literature. Effects on various grades of tin, solders, babbitt metals and bearing metals. Tables. 82 ref. (Sn)

123-V. (English.) **Aluminium and Its Alloys in 1953. Some Aspects of Research and Technical Progress Reported.** E. Elliott. *Metallurgia,* v. 49, no. 292, Feb. 1954, p. 82-90.

Extraction, founding, fabrication, constitution and properties. 107 ref. (Al)

124-V. (French.) **Recent Progress in Tin Research.** E. S. Hedges. *Metallurgia italiana,* v. 46, no. 1, Jan. 1954, p. 13-21.

Work of Tin Research Institute in field of tin plating, electrodeposition of tin and its alloys, corrosion, antifriction alloys, pewter ware, copper-base alloys and tin-base organo-metallic compounds. Photographs, micrographs. (Sn)

125-V. Tenzaloy (High Strength Aluminum Casting Alloy). *Alloy Digest,* no. Al-15, Apr. 1954.

Composition, physical constants, properties, heat treatment, machinability, weldability, castability, corrosion resistance and general characteristics. (Al)

126-V. Tuf Stuf 224K (Heat Treatable Aluminum Bronze). *Alloy Digest,* no. Cu-15, Apr. 1954.

Composition, physical constants, properties, heat treatment, machinability, weldability and general characteristics. (Cu)

127-V. AISI E52100 (Bearing Steel). *Alloy Digest,* no. SA-16, Apr. 1954.

Composition, physical constants, properties, heat treatment, machinability and general characteristics. (AY)

128-V. U.S.S. Cor-Ten (High-Strength Low-Alloy Steel). *Alloy Digest,* no. SA-17, Apr. 1954.

Composition, properties, heat treatment, machinability, workability, weldability, corrosion resistance, general characteristics and applications. (AY)

129-V. Carpenter Stainless No. 10 (A Stainless Steel for Severe Service). *Alloy Digest,* no. SS-14, Apr. 1954.

Composition, physical constants, properties, workability, machinability, corrosion resistance, pickling and general characteristics. (SS)

130-V. Rem-Cru C-130AM (Titanium Alloy). *Alloy Digest,* no. Ti-3, Apr. 1954.

Composition, physical constants, properties, heat treatment, workability, machinability, weldability and general characterisics. (Ti)

131-V. Bearcat (Shock-Resisting Tool Steel). *Alloy Digest,* no. TS-20, Apr. 1954.

Composition, properties, heat treatment, workability, machinability and general characteristics. (TS)

132-V. Non-Heat Treatable Titanium Goes To Work. Thomas A. Dickinson. *Steel,* v. 134, Apr. 5, 1954, p. 136-137, 140.

Methods for annealing, welding, inspection, forming and machining. Photographs, table. (Ti)

133-V. (Russian.) **Magnesium Alloys.** Ia. E. Afanas'ev. *Vestnik Mashinostroeniia,* v. 34, no. 2, Feb. 1954, p. 39-42.

Chemical compositions and physical, mechanical and technological properties. Tables. 5 ref. (Mg)

134-V. (Book.) **Heat-Resisting Steels and Alloys.** C. G. Conway. 180 p. 1953. D. Van Nostrand Co., Inc., 250 4th Ave., New York 3, N. Y. $5.00.

A concise data book giving high-temperature properties of commercial steels and alloys. (SS, SG-h)

135-V. (Book.) **Metallurgy of the Rarer Metals. Chromium.** A. H. Sully. **Zirconium.** G. L. Miller. v. I-II. 225 and 400 p. Academic Press Inc., 125 E. 23rd St., New York. $5.50 and $7.50.

History and occurrence of the metals; world supplies; consumption and use; commercial alloys; physical properties; casting; fabrication; and use of metal. (Cr, Zr)

136-V. (Book.) **Symposium on Tin.** ASTM Special Technical Publication no. 141. 111 p. 1952. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $2.50. $1.85 to members of ASTM.

Production; resources; coatings; properties; applications; and analysis. Papers are separately abstracted. (Sn)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

METALLURGICAL CHEMIST: Established producer of chemical products for metal treatment desires chemist with specialized experience in physical metallurgy. Strong inorganic background required. Knowledge of heat treatment processes, inorganic surface treatments, or metal deformation and cutting lubricants desirable. Under 35. Middle Atlantic location. Opening available promptly. Salary commensurate with attainment, experience and responsibilities. Box 5-10.

INSTRUCTOR or ASSISTANT PROFESSOR: To teach physical metallurgy, starting September 1954, engineering school, New York City. Opportunity for consulting or for study for advanced degree. Send resume with educational and experience background. Box 5-15.

Midwest

PHYSICAL METALLURGIST: Technical man with good background in physical metallurgy and approximately five years in the processing and development of refractory metals, with direct experience in titanium, zirconium, molybdenum or chromium. Send full particulars in first letter. Box 5-20.

METALLURGIST: Excellent opportunity for young man with medium-size manufacturer of power plant equipment. Wide variety of problems in ferrous and nonferrous metallurgy. Some welding or iron foundry experience helpful. Box 5-25.

SALES ENGINEER: Long-established national manufacturer of furnaces and related equipment is adding to sales staff a man with metallurgical or electrical degree. Recent graduate with 2 to 5 years experience in plant and sales preferred, with some management qualifications. Please reply by letter with full outline of education, experience, personal data and include photograph. Box 5-30.

METALLURGIST: Automotive and aircraft parts manufacturer desires man under 30 with B.S. or M.S. degree in metallurgy for position in product development and engineering. Position includes work in high-temperature testing, alloy development, prevention of wear, analysis of field service problems and report writing. Submit details of education and industrial experience and a recent photograph. Box 5-35.

SENIOR CHEMISTS, METALLURGISTS or PHYSICISTS: Opportunities for senior metallurgical engineers, ceramists or physicists. Work involves applied research and development of high-temperature or corrosion resistant materials. Primary interest in interpretation of data rather than experimental approach is desired. Ph.D. or equivalent in physical chemistry, physical metallurgy, ceramics or physics is essential, with 8 to 10 years experience in these fields. Write: Aircraft Nuclear Propulsion Department, General Electric Co., Cincinnati 15, Ohio.

SENIOR METALLURGICAL ENGINEERS, CERAMISTS or PHYSICISTS: Opportunities in applied research and development of materials for service in aircraft power plants. Positions are available in fields of radiation studies and ceramic research as applied to nonmetallic inorganic high-temperature materials. Ph.D. or equivalent in physical chemistry, physical metallurgy or ceramics is essential with 8 to 10 years experience in work involving radiation effects of corrosion resistant or high-temperature materials. Interest in experimental approach is desirable. Write: Aircraft Nuclear Propulsion Department, General Electric Co., Cincinnati 15, Ohio.

SENIOR CHEMISTS, METALLURGISTS or PHYSICISTS: Opportunities for senior physical chemists, physical metallurgists or physicists. Work involves correlation and analysis of radiation effects on materials. Primary interest in interpretation of data rather than experimental approach desirable. Ph.D. degree or equivalent in physical chemistry, physical metallurgy or physics is essential with 8 to 10 years experience in work involving radiation effects. Write: Aircraft Nuclear Propulsion Department, General Electric Co., Cincinnati 15, Ohio.

PRODUCTION METALLURGIST: Experienced in induction melting of carbon steels, stainless steels and high-temperature alloys. Location-Michigan. Box 5-40.

ASSISTANT PROFESSOR OF PHYSICAL METALLURGY: At large university, about half time teaching graduate and undergraduate courses, half time research. Ph.D. or Sc.D. specializing in transformation, metallurgical thermodynamics or X-ray diffraction preferred. Other fields may also be considered. Box 5-45.

METALLURGIST: Recent graduate with 1 to 3 years experience to conduct welding and brazing research in ferrous and nonferrous metals fields. Outstanding opportunity for professional growth. Send resume to: J. F. Collins, Armour Research Foundation, 10 W. 35 St., Chicago 16, Ill.

METALLURGIST - CHEMIST: Progressive manufacturing company with national sales force desires man for supervision of technical aspects of electroplating and heat treating

operations. Must have good scholastic background in chemistry and metallurgy coupled with experience in plating, heat treating and metallurgical laboratory. Box 5-50.

Government

The Naval Research Laboratory, Washington, D. C., has announced the following vacancies in the physical sciences and engineering fields. ELECTRONIC SCIENTISTS; PHYSICISTS for corrosion research and various other problems; and CHEMISTS for corrosion research, etc. Salaries from $5940 to $7040. For most vacancies Civil Service status is *not* necessary because of the shortage existing. Write: Code 1817, Naval Research Laboratory, Washington 25, D. C.

POSITIONS WANTED

METALLURGICAL ENGINEER: B.S. degree. Five years experience in research and development in powder metal field, including processing techniques, heat treatment, physical testing and metallography of metal powders. Desires responsible position in powder metal field, research, development or production. Midwest or Northeast preferred. Box 5-55.

PHYSICAL METALLURGIST: Ph.D. degree, age 33, married, children. Desires employment in research and/or development. Will consider more general types of work where technical ability is of prime importance. Eight years experience in research on weldability and notch brittleness testing of steel and general physical metallurgy; five years teaching physical metallurgy. Consulting experience. Presently associate professor of metallurgy. Box 5-60.

METALLURGICAL ENGINEER: B.S. degree, age 29, married. Powder metallurgy, high-temperature materials. Research and development for two years, experienced in all phases of powder metallurgy including hydrostatic pressing and die design. Physical testing, stress-rupture, impact, etc. Three years additional industrial experience. Desires position in development or production. Location unimportant. Box 5-65.

METALLURGIST: M.S. degree, age 31, married. Extensive work in liquid metal, fused salt and aqueous corrosion. Some metallographic, physical testing and production trouble shooting work. Report writing and supervisory experience. Desires responsible research or development position in corrosion or physical metallurgy. Box 5-70.

METALLURGICAL ENGINEER: B.S. degree, age 42, family. Extensive carbon, alloy and stainless steel mill experience in research, development and contact. Also production heat treat experience and recently in own heat treat company. Knows all phases of management. Will travel. Box 5-75.

METALLURGICAL ENGINEER: B.S. and M.S. degree, age 31, married. Six years experience in development and research work. Desires teaching position in university. Box 5-80.

MANAGEMENT POSITION: Experienced in technical development; engineering (electrical, chemical, mechanical and ceramic); construction; manufacturing; maintenance, cost reduction; corrosion engineering covering metals, plastics, paints, lubricants and ceramics; sales, advertising on local and national basis; plastic, ceramic and pharmaceutical plants. Desires challenging position in East. Age 42, married. Box 5-85.

METALLURGIST: Desires position in technical sales or service of metal fabricator or producer. Qualified by five years experience in laboratory development work, troubleshooting and sales. Thorough knowledge of stainless steels and high-nickel alloys. B.S. degree, age 27, family. Location immaterial. Box 5-90.

PHYSICAL METALLURGIST: Doctorate, family. Has had 23 years experience in teaching, research and development. Participation in technical society activities and technical committees. Publications and patents. Desires responsible position with progressive university or industrial organization. Box 5-95.

METALLURGICAL ENGINEER: Degree, age 34, family man, personable, cooperative. Diversified experience at staff level in heat treatment, material selection, lubrication, mechanical design, failure investigations, standards, tooling and associated phases of ferrous and nonferrous material and process engineering required in volume production. Able to accept challenges of competitive market. West Coast preferred. Box 5-100.

METALLURGIST: Interested in employment outside U. S. for 1 to 3 years. Reads German, Spanish, French and Italian. Single and in good health. B.S. in mechanical engineering, post-graduate studies and research. Presently employed as project engineer in nonferrous plant with duties covering wide range of activities such as supervision, development, design and contact work. Box 5-105.

METALLURGIST: Young technical executive with 13 years experience in industry, 5 of them in powdered metals, since graduation from Notre Dame in 1940. Line responsibility for production as well as staff work covering research, control and engineering. Interested in stable company in production or research. Box 5-110.

METALLURGIST: Desires position in practical metallurgy and heat treating. Has had 25 years experience in one company in material specifications for highly stressed precision parts of toolsteel and alloy grades with the corresponding heat treatments. Experience in material inspection, testing, quality control and trouble shooting. Supervised large heat treating department. Box 5-115.

METALLURGIST: B.S. in metallurgical engineering, age 26, married, family. One year experience in aluminum foundry, three years as chief metallurgist and chemist for ordnance plant. Has done research and development work in cold extrusion. Experienced in heat treatment, metallography, chemical analysis, phosphate coatings. No location preference. Box 5-120.

ADMINISTRATIVE ASSISTANT: M.S. degree in metallurgy, age 27, married. Four years business experience, two in export field. Desires position in sales, sales administration or purchasing. Presently employed as sales engineer by large foreign distributor of major electrical company. New York City only. Box 5-125.

TOOLSTEEL EXPERT: Age 37, married. Desires responsible position in sales service problems and contact with industry such as toolsteel serviceman in the Los Angeles area. Eighteen years diversified experience with large cutting tool concern, relating to sales and customer problems, production troubleshooting, research product development. Box 5-130.

METALLURGICAL ENGINEER: B.S. degree in metallurgy, M.B.A. in management in June 1954. Age 32, single. Ten years experience in electronic tube pilot plant and manufacturing, Navy electronic training, organic finishing, electroplating and metallic materials application. Desires position which will effectively utilize engineering education, diversified industrial experience and graduate training in business administration. Box 5-135.

Invitation to Entrants

9th Metallographic Exhibit

Entries are invited in the 9th ASM Metallographic Exhibit, to be held at the National Metal Exposition in Chicago the week of Nov. 1 through 5, 1954. Entries will be displayed to good advantage and awards will be given for the best micrographs as decided by a committee of judges.

Classifications of Micros

1. Toolsteels and tool materials
2. Stainless steels and heat resisting alloys
3. Other steels and irons, cast or wrought
4. Aluminum, magnesium, beryllium, titanium and their alloys
5. Copper, nickel, zinc, lead and their alloys
6. Metals and alloys not otherwise classified
7. Series showing transitions or changes during processing
8. Welds and other joining methods
9. Surface phenomena
10. Results by unconventional techniques (other than electron micrographs)
11. Slags, inclusions, refractories, cermets

Awards and Other Information

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence. A Grand Prize, in the form of an engrossed certificate and a money award of $100, will also be awarded the exhibitor whose work is adjudged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's National headquarters in Cleveland.

All photographs may be retained by the Society for one year and placed in a traveling exhibit to the various Chapters. They will be returned to the owners in May 1955 if so desired.

Rules for Entrants

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints shall be mounted on stiff cardboard; maximum dimensions should be limited to 15 by 22 in. Heavy, solid frames are not permissible because of difficulties in mounting the exhibit. Entries should carry a label on the face of the mount giving:

Classification of entry
Material, etchant, magnification
Any special information as desired

The name, company affiliation and postal address of the exhibitor should be placed on the BACK of the mount.

Transparencies or other items to be viewed by transmitted light must be mounted on light-tight boxes wired for plugging into lighting circuit, and built so they can be fixed to the wall.

Entrants living outside the U.S.A. should send their micrographs by first-class letter mail endorsed "Photo for Exhibition—May be opened for customs inspection." To be acceptable as first-class mail the package should measure no more than 35 x 45 cm. (14 x 18 in.)

Exhibits must be delivered before Oct. 15, 1954, either by prepaid express, registered parcel post or first-class letter mail, addressed to:

National Metal Exposition
International Amphitheater
43rd and Halsted Sts.
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36th National Metal Congress and Exposition

Chicago, Ill. **November 1 to 5, 1954**

STOCK FURNACE PARTS AND ACCESSORIES

Salt Bath Transformers, Contactor Panels and Ammeters

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2—50 kva, 460 volts, single phase
1—50 kva, 460 volts, 3/2 phase
1—75 kva, 460 volts, 3/3 phase
2—100 kva, 460 volts, 3/2 phase
1—125 kva, 460 volts, 3/2 phase
1—175 kva, 460 volts, 3/2 phase

Angle Thermocouples

12 x 18
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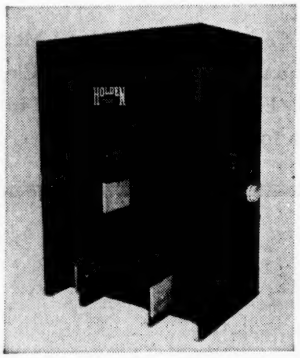

1—5 kva, 230 volts, single phase
1—15 kva, 230 volts, 3/2 phase
1—25 kva, 230 volts, 3 phase
1—36 kva, 240 volts, single phase
3—75 kva, 230 volts, 3/2 phase
1—100 kva, 230 volts, 3/2 phase
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*NOTE: We do not maintain an itemized list of this stock due to the fact that from $10,000 to $20,000 of this material is available as a part of our fabrication to complete electrode assemblies.

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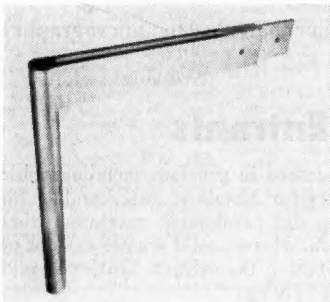

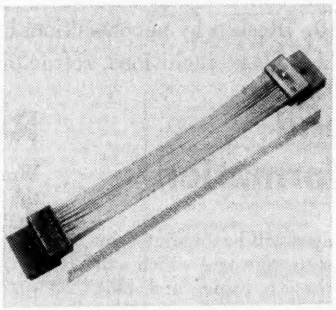

Complete electrode assemblies and cables fabricated in 2 to 4 days from receipt of order.

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DELIVERY: Furnace parts are considered to be basically stock items manufactured against anticipated use. Therefore, this list represents the average list of transformers, contactor panels, ammeters or instruments and alloy stock which is currently being replaced as consumed. Delivery if material is not in stock: from 4 to 8 weeks depending on manufacturing schedules or percentage of manufacture at that time.

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